



FRIDAY, JANUARY 20.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings Next Week.—West Virginia & Pittsburgh.

Elections.—Boston & Lowell, T. L. Higginson, President.—Des Moines & Kansas City, James Donahue, Superintendent.—Duluth, Fergus Falls & Southern, Jacob Austin, President.—Forth Worth & Denver City, E. P. Henderson, Master Mechanic.—Hoosac Tunnel & Wilmington, Daniel H. Newton, President.—Isbell & Iron Mountain, C. H. Castle, President.—Poughkeepsie & Delaware Valley, Grinnell Burt, Vice-President.—Richmond & Danville, Capt. W. H. Green, General Superintendent.—San Francisco & North Pacific, H. C. Whiting, General Superintendent.

New Companies Organized.—Cumberland Valley & Unaka is incorporated in Georgia.—Hoosac Tunnel & Wilmington is organized in Massachusetts.—Montgomery Extension filed articles in California.—Ortonville & Southwestern filed articles in Minnesota.—Raritan River is organized in New Jersey.—Rochester & Honeoye Falls is incorporated in New York.

Changes and Extensions.—Alabama: Mobile & Hattiesburgh begins survey. Kansas: Kansas City, Wyandotte & Northwestern is completed to Seneca. Texas: Atchison, Topeka & Santa Fe completed to Panhandle City.—Chicago, Kansas & Nebraska is surveyed to Wichita Falls.

Traffic.—Anthracite coal shipments for the week ending Jan. 14 show an increase of 18.9 per cent., as compared with the same period last year; bituminous shipments show an increase of 13.2 per cent. Cotton receipts, interior markets, for the week ending Jan. 13 show a decrease of 6.3 per cent. as compared with the corresponding week last year; shipments show a decrease of 5.4 per cent.; seaport receipts show an increase of 1.2 per cent.; exports a decrease of 22.4 per cent.; cotton in sight is greater than at the same date last year by 6.0 per cent.

Earnings.—Ninety roads report gross earnings for December, 26 showing a decrease; the net increase is \$2,644,647, or 11.8 per cent. For the month of November 18 roads report gross and net earnings, 1 showing a decrease in gross and 8 a decrease in net. The net decrease is \$51,977, or 1.3 per cent. Fifteen roads report gross and net earnings for the 11 months to Nov. 30, 1 showing a decrease in gross, and 3 a decrease in net. The net increase is \$7,721, \$13, or 30.8.

Miscellaneous.—Chester Valley is sold to the Philadelphia & Reading.

Contributions.

Train Orders.

PITTSBURGH, Pa., Jan. 9, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A recent collision on the Wheeling Division of the Baltimore & Ohio sharply brings up the question of allowing a train with inferior rights to run against a train having the right of track, unless the order is first delivered to the ruling train and signatures from its conductor and engineer received before the inferior train is allowed to proceed.

In the case referred to there were three sections of train 87, the first section being about on time, the other two several hours late and running very close together. An order was sent to 2d 87 fixing a meeting point with an extra train. The operator who received this order came on duty after 1st 87 had passed, and seeing the other two sections together, made the very natural mistake of thinking the first train was 1st 87, and having no orders for anything ahead of 2d 87, gave it (the first train) a white signal, at the same time sending the dispatcher his acknowledgement of the order. To make the blunder worse, the conductor of the 3d section came into the office just at this time, and on the operator asking him if he was conductor of 2d 87, replied that he was. He afterward testified before the Coroner that he did not mean that he was on 2d section, but that his was the second train then there.

While, no doubt, these facts show carelessness, they also prove how some incident, trivial in itself, or some slight verbal misunderstanding, may, under this system, easily cause serious trouble. In this case three men lost their lives, several others were injured, and the damage to property was great.

The question is, Is it safe railroading to put the responsibility of holding trains on an operator alone? The general opinion seems to be that it is not, but that circumstances require it to be done sometimes; in fact the new code by inserting the words "whenever practicable" in Rule 510 admits this fact, but the practice on most roads is to start the inferior train as soon as the operator to whom the order for the superior train is sent acknowledges its receipt; often too, when by a little foresight these orders might have been sent to another office and signatures obtained before the inferior train had occasion to use the order. In many other cases these signatures could be gotten and orders made complete to both trains at the same time by holding the inferior train back a few minutes.

I have in mind a road, which, although it has not yet adopted the new code, has been for some years running trains under a system so similar that a change to the new rules would hardly be noticeable. It uses the duplicate order exactly as provided for by Rule 510, but in addition to this, in cases where the dispatcher fully expects that the inferior train will need orders at a time when he cannot reach the superior train, uses an additional precautionary measure. This consists of a regular train order to the conductor and engineer of the superior train to not pass a certain point without orders. This, of course, is only given where definite meeting points cannot be made, or other more definite orders given at the time, and is generally given at a starting point or some regular stopping place, so that no time is lost in delivering; and the point where the train is held for orders is also, when possible, some point where orders can be given without any extra detention. Of course the operator at the last mentioned point holds the duplicate of every order given to inferior trains, and keeps his signal set at danger. Here, then, are three men all responsible and interested in the delivery of the orders; the operator holding the orders and the conductor and engineer of the superior train, by virtue of their order to not pass that point without first obtaining orders.

In actual practice this has been found to work very smoothly and successfully; the fact being definitely understood that an inferior train is not to be moved, under any circumstances, against a superior train unless the latter is first held either by signatures to the duplicate order, or by a "not pass — without orders." A dispatcher can generally anticipate future orders and keep trains moving with just as little detention as can be done under the "X ing" or "O. K." systems, while at the same time absolute safety from accidents caused by non-delivery of orders is fully insured.

ORDERS.

The Michigan Commissioner on "Income Balances."

LANSING, Mich., Jan. 9, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice the editorial comments in the last issue of the *Railroad Gazette* upon the subject of "Income Balances," referred to in the Annual Report from this office, for 1887. As I think that to some extent you misapprehended the purpose of our allusion to the matter, a word of explanation may place us in a clearer position before your readers.

The situation as stated by you is entirely apparent to the expert railroad accountant, and we sought by the figures presented to make it equally so to the comprehension of the average citizen and legislator, whose methods of book-keeping are exceedingly simple, and who all the time are resting under the impression that such balances stand for actual resources at the company's disposal at the close of the year's business. The large sums so carried forward by a number of the companies reporting to this department, coupled with small or no dividends at all, have attracted the attention of our recent legislatures, and the real situation not being understood have been made the pretext for attempted legislation unfavorable to railroad interests. The general and perhaps reasonable conclusion of most people is that the balance in an income account should represent amount of cash, or cash assets, in the hands of the treasurer available, or to become available, for the payment of fixed charges and dividends, —a balance in fact remaining after every object of expenditure authorized during the year and actually made has been taken to account. And it is not understood to be a balance that should increase year after year, while in fact large additions to the cost of the property, more than sufficient to exhaust such balance, are being made from current earnings, the outlay only figuring on the floating debt or perhaps simply as a credit to the treasurer.

To correct such misleading practice, we certainly agree with you that each year's business should stand complete by itself, so that the balance carried forward in the annual returns should represent a reality and not a delusion.

W. C. RANSOM, Deputy Commissioner.

"High Bridge" Across the Mississippi at St. Paul.

We are informed that the contract for the superstructure of this bridge has been let to Mr. C. L. Strobel, representing the Keystone Bridge Co. It is a highway bridge, but of unusual magnitude. It is to span the Mississippi at St. Paul, from Forbes street to Mohawk avenue. The total length is 2,770 ft. between the faces of the abutments, and the roadway rises on a continuous 4 per cent. grade from 80.5 ft. at the north abutment to 191.3 ft. at the south abutment. There are 29 piers, including the two abutments. Masonry is used only to carry the foundations above the high water line. Above the masonry the piers are iron trestle bents, each bent composed of two columns braced, with a transverse batter of not less than one in eight. Fourteen of these bents are united in pairs to form seven braced towers. In the three higher towers the bents are spaced 50 ft., and in the four lower towers they are 40 ft.

The remaining 13 bents are placed singly, and rock on the masonry piers. The highest bent is 127.8 ft., and the lowest 32.9 ft. above the masonry.

The spans are as follows, as called for by the specifications of the City Engineer: Four 40 ft. spans (tower spans), riveted plate girder; three 50 ft. spans (tower spans), riveted plate girder; two 60 ft. spans, riveted plate girder; nine 80 ft. spans, riveted lattice girder; five 90 ft. spans, riveted lattice girder; one 170 ft. span, pin connected truss; four 250 ft. spans, pin connected truss.

The bridge is to be a deck bridge throughout, 41 ft. 6 in.

between railings, 24 ft. roadway and two 8 ft. sidewalks. The trusses are to be spaced 22 ft. centre to centre.

Provision must be made in all the structures for the free expansion and contraction of all parts corresponding to a variation of 150° Fahr. in the temperature.

The structure is to be of wrought iron throughout and the roadway planked and paved with 4 in. cedar blocks. The total weight of iron in the design accepted is calculated at 5,822,000 lbs. The specifications for the load are as follows:

All parts of the structure shall be proportioned to carry, besides their own weight and due share of dead load, the following live loads:

Main trusses and girders—For spans 90 ft. and less, 100 lbs. per square foot, roadway and sidewalk; for spans 170 ft., 90 lbs. per square foot, roadway and sidewalk; for spans 250 ft., 80 lbs. per square foot, roadway and sidewalk.

The floor system of the bridge—100 lbs. per square foot, roadway and sidewalk.

A load of fifteen tons on four wheels, space 6 x 10 ft., placed anywhere on the roadway, shall not produce in any member a strain exceeding the unit strain allowed for that individual member by more than 25 per cent. Two-thirds of the load on each wheel shall be considered carried by the stringer over which it is placed, and one-third distributed by the floor.

To provide for wind-strains and vibrations, the lateral bracing of the trusses and girders shall be proportioned to resist a lateral force of 450 lbs. per linear foot of bridge. One-third of this shall be considered carried by the lateral bracing of the unloaded chord, and two-thirds by the lateral bracing of the loaded chord.

The contract price for the superstructure is \$340,000. This contract has been for some months in dispute, there having been a lower bidder, and the award to the Keystone Bridge Co. having been approved by certain property holders. The matter has, however, been adjusted and the contract let as here stated.

The contract for the substructure was let to Mr. A. McMullen, and that work is now about half done. The itemized contract price for the substructure will amount to about \$136,000.

The Pacific Railroad Investigation.

PRESIDENT CLEVELAND'S MESSAGE.

The majority and minority reports recently made on the condition of the government land-grant railroads were on Tuesday of this week sent by President Cleveland to Congress, with a message which we summarize below.

The President recites the facts concerning the appointment of the commissioners and the reasons therefor, and briefly rehearses the laws under which the grants were originally made. He says: These reports exhibit such transactions and schemes connected with the construction of the aided roads and their management, and suggest the invention of such devices on the part of those having them in charge for the apparent purpose of defeating any chance for the government's reimbursement, that any adjustment or plan of settlement should be predicated upon the substantial interests of the government rather than any forbearance or generosity deserved by the companies.

The President then refers to the defense made by the Central Pacific, which appeared in the newspapers a few days subsequent to the publication of the Commissioners' report, and quotes from this defense as follows:

"It may be said of this contract (between the road and a construction company owned by the directors), as of many others that were let to the different construction companies in which the directors of the Central Pacific have been stockholders, that they built the road with the money furnished by themselves, and had the road for their outlay. In other words, they paid to the construction company the bonds and stock of the railroad so constructed, and waited until such time as they could develop sufficient business on the road built to induce the public to buy the bonds or the stock. If the country through which the road ran developed sufficient business, then the project was a success; if it did not, then the operation was a loss. These gentlemen took all the responsibility; any loss occurring was necessarily theirs, and of right the profit belonged to them."

"But it is said that they violated a well-known rule of equity in dealing with themselves; that they were trustees, and that they were representing both sides of the contract. The answer is that they did not find anybody else to deal with. They could not find any one who would take the chances of building a road through what was then an almost uninhabited country and accept the bonds and stock of the road in payment. And when it is said that they were trustees, if they did occupy such relation it was merely technical, for they represented only their own interests on both sides, there being no one else concerned in the transaction. They became the incorporators of the company that was to build the road, subscribed for the stock and were the only subscribers. Therefore it is difficult to see how any one was wronged by their action. The rule of equity invoked, which has its origin in the injunction, 'no man can serve two masters,' certainly did not apply to them, because they were acting in their own interests and were not charged with the duty of caring for others' rights, there being no other persons interested in the subject matter."

The message then goes on to say that the act of 1832 provided for \$16,000 per mile of government bonds and 5 sections of public land for each mile built; that all earnings from government transportation were to be applied in payment of indebtedness to the government, and the bonds were to be a first mortgage. But the modifications granted by Congress two years later provided that there should be 10 sections of land per mile instead of 5; that the bonds should be delivered oftener; that they should be second lien instead of first, and that only one-half of government transportation charges should be applied to bond payments. The President continues:

When the relations created between the government and these companies by the legislation referred to is considered, it is astonishing that the claim should be made that the directors of these roads owed no duty except to themselves in their construction, that they need regard no interests but their own, and that they were justified in contracting with themselves and making such bargains as resulted in conveying to their pockets all the assets of the companies. As a licenior the government was virtually interested in the amount of the mortgage to which its security had been subordinated; and it had the right to insist that none of the bonds secured by this prior mortgage should be issued fraudulently, or for the purpose of diversion among these stockholders without consideration. The doctrine of complete independence on the part of the directors of these companies, and their freedom from any obligation to care for other interests than their own in

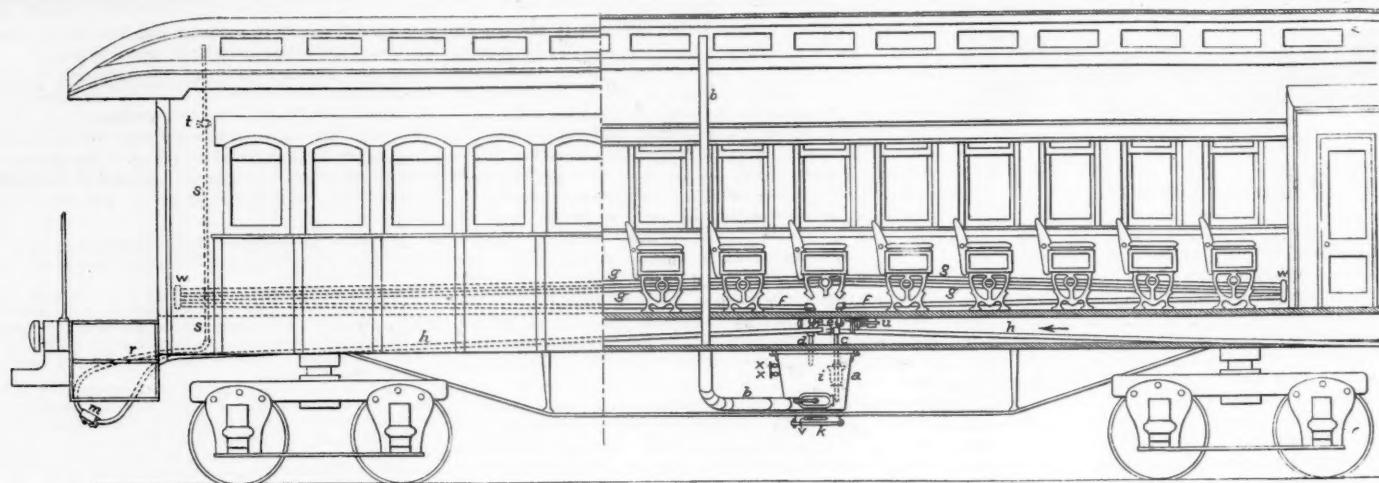


Fig. 1.

Fig. 2

General View of Car

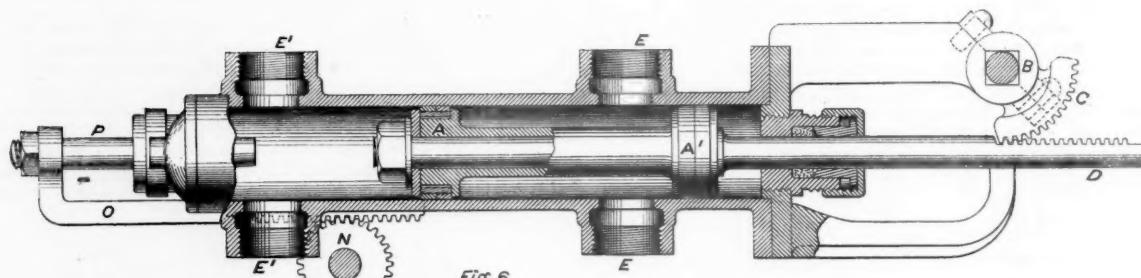


Fig. 6.

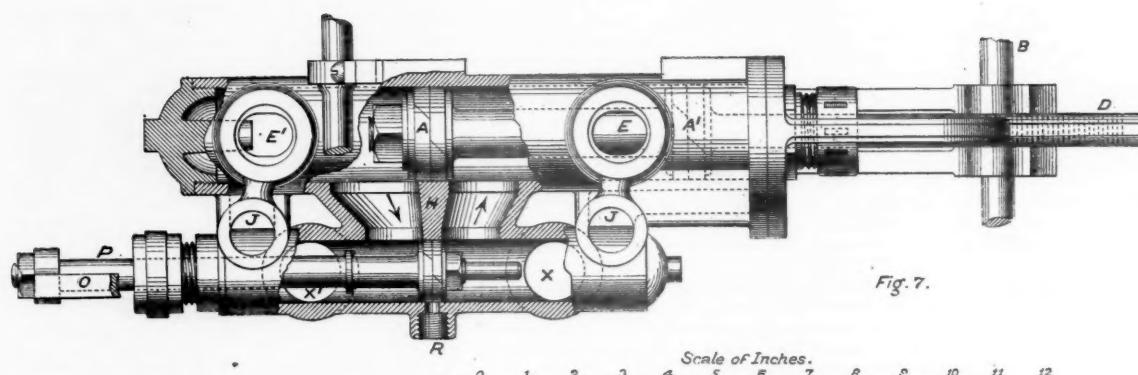


Fig. 7.

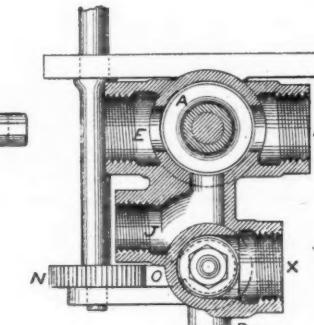


Fig. 8.

Scale of Inches.

THE SEWALL SYSTEM OF CONTINUOUS HEATING.

the construction of these roads, seem to have developed the natural consequences of its application, portrayed as follows in the majority report of the Commissioners: "The result is that those who have controlled and directed the construction and development of these companies have become possessed of their surplus assets through issues of bonds, stocks, and the payment of dividends voted by themselves, while the great creditor, the United States, finds itself substantially without adequate security for the repayment of its loans."

The laws enacted in aid of these roads, while they illustrated a profuse liberality and a generous surrender of the government's advantages, which it is hoped experience has corrected, were nevertheless passed upon the theory that the roads should be constructed according to the common rules of business fairness and duty, and that their value and their ability to pay their debts should not be impaired by unfair manipulations; and when the government subordinated its lien to another, it was in the expectation that the prior lien would represent in its amount only such bonds as should be necessarily issued by the companies for the construction of their roads at fair prices, agreed upon in an honest way, between real and substantial parties. For the purpose of saving or improving the security afforded by its junior lien, the government should have the right now to purge this paramount lien of all that is fraudulent, fictitious or unconscionable. If the transfer to innocent hands of bonds of this character, secured by such first mortgage, prevents their cancellation, it might be well to seek a remedy against those who issued and transferred them. If legislation is needed to secure such a remedy, Congress can readily supply it.

President Cleveland then suggests the propriety of the government withholding further performance of its obligations under the contract, provided the failures on the part of the roads warrant such a course. Any action to withhold donated lands should be taken by Congress, it being doubtful whether the Executive has power to take such a step.

The California & Oregon, a part of the Central Pacific, is now completed, and has applied for its land grants. The President reminds Congress that action should be taken before he orders this land delivered to the road.

The troublesome complications which characterize this entire matter should now be finally settled; the government should not take possession of the roads so long as any other remedy is possible, and the message concludes as follows: I suppose we are hardly justified in indulging the irritation and indignation naturally arising from contemplation of malfeasance to such an extent as to lead to the useless destruction of these roads or the loss of the advances made by the government. I believe that our efforts should be in a more practical direction, and should tend, with no condo-

nition of wrong doing, to the collection by the government on behalf of the people of the public money now in jeopardy. While the plan presented by a majority of the Commission appears to be well devised, and gives at least partial promise of the results sought, the fact will not escape attention that its success depends upon its acceptance by the companies and their ability to perform its conditions after acceptance. It is exceedingly important that any adjustment now made should be final and effective. These considerations suggest the possibility that the remedy proposed in the majority report might well be applied to a part only of these aided railroad companies.

The Sewall System of Continuous Heating.

BY C. POWELL KARR, C. E.

The principles involved in this system are as follows: The heating power of dry steam obtained from the locomotive under a pressure of from 2 to 20 lbs. per square inch; an open circulation, that is one not returning the steam to the source of supply, but allowing the product of condensation to run to waste; a uniform supply regulated by the amount of condensation; the supply for each car controlled independently from the supply to the train; and the carriage of all water or condensation from probable points of lodgement to a point of discharge in each car, and a separate heater for various exigencies.

The mechanical devices used in the system are:

1, the system of piping; 2, the coupler; 3, the reducing valve for controlling the supply to the train; 4, the regulating valve for controlling the supply to each car; 5, the steam trap in each car for discharging the water of condensation, and 6, the auxiliary heater.

THE LOCOMOTIVE.

Live steam is taken from the dome through a common angle valve and after passing through a reducing valve which reduces the pressure to from 2 lbs. to 20 lbs. per sq. in., passes underneath the flooring of the cab and under the tender. The pipe under the tender is highest in the centre, inclining to the ends of the tender to facilitate the drainage of condensed water. A rubber hose connection is placed in the piping between the engine and tender.

The general arrangement of the apparatus on a car is shown in figs. 1 and 2. The car in this illustration is the

rear car of the train, fig. 1 showing the rear end and fig. 2 a partial section of the front portion of the car.

The steam passes through the coupling and hose through the pipe *H* to the regulating valve *e* under the car. The steam then passes through the radiating pipe *F* to manifold *W*, and so through pipe *G* to another manifold at the rear end of the car, and through pipe *F* back to the centre of the car, re-entering valve *ee* and passing out through pipe *H* to rear. The regulating valve, which will be described later on, permits the brakeman to regulate the amount of steam passing from the pipe *H* to the radiating pipes in the car, the balance flowing through the pipe *H* to the rear. The valve thus regulates the heat in the car, and any particular car in the train, or any number of cars of the train, can be "cut out" and no heat furnished, if it is so desired, without in any way hindering the supply for the other cars.

The main supply pipe runs the length of the train, and is 1½ in. internal diameter. The radiating pipes are of the same size, and follow the wall of the car from end to end, entering and departing through the regulating valve in the centre of the car. The number of radiating pipes depends upon the climate of the country in which the cars are run. For example, in Maine and Minnesota four pipes on each side of the car are necessary, and in an ordinary passenger car there would be about 400 ft. of 1½ in. piping. In milder climates less piping is used, but in this system it is claimed that the additional amount of piping will not increase the difficulty of keeping the temperature uniform, as each full length of radiating pipe can be short-circuited and cut off from its adjacent length, and so the circulation can be confined to as few pipes as possible, or the supply of steam can be reduced so as to just maintain the needed temperature. The former system is the most economical, since the greater surface of piping in the latter system at a reduced pressure, causes a greater relative condensation on account of the greater surface of distribution, but in very cold weather or in a very changeable climate, as, for example, the North Atlantic States, the combination of the two or the latter alone is extremely desirable, the factor needed being a greater ratio of radiating surface rather than an increase of steam pressure,

The earlier Sewall patents showed a U loop under each seat. The amount of friction which such an arrangement forces the steam to overcome would interfere with the practical working of the system with low pressure for a long train, and it has been wisely abandoned; in its present arrangement its designers have studied to lessen the frictional resistances, which have proved to be so great in the continuous heating of long trains.

THE COUPLER.

The success of any system of steam heating appliance for railway trains depends in a large measure upon the mechanical devices resorted to in the effort to meet the requirements of the service. The most important device is undoubtedly the coupler, and in the long run, other parts being relatively good, that system will be the most successful which is in possession of the best coupler.

Figs. 3, 4 and 5 show the coupling in detail. In Fig. 3 is a vertical section of the coupler, exhibiting the annular space I packed with mineral wool, or some other equally good non-conductor, to lessen condensation as much as possible. This packing extends to the gaskets. Fig. 4 is a plan of the coupler as coupled between cars. Fig. 5 is a view of one-half of the coupler disconnected.

The couplings consist of two similar reversed halves with interlocking arms moving on vertically inclined arcs, which, upon coming into complete contact, are securely locked. They will withstand any pressure, and remain tight until the cars are pulled asunder, when the bent hose straightens by tension, and upon continuing the upward turn taken to reach a level, the hose uncouple.

In coupling, the couplers are raised, one in each hand of the operator. The tooth and recess on the under side of one half are placed squarely in contact with the recess and tooth of the other, forming the pivot of a hinge joint, on which the couplings are turned by a downward motion. The lug D engages with the arm E (see fig. 4) on each half. The gaskets are pressed together firmly and the operation completed.

In uncoupling, these motions are exactly reversed. The couplings are raised by tension on the hose or other means, when the locking devices disengage and the couplings separate.

The rounded projection F acts as a sort of hinge to aid in the coupling, and fits into a corresponding recess in the other coupler (see fig. 3).

The hose is fastened to the nozzle A, fig. 5, by clamps as indicated. The gasket B was formerly made of rubber, but vulcabeston is now used, and it forms one of the abutting surfaces of the joint of the two parts. On each nozzle is cast a flange H, which is fastened to the body of the coupling by two bolts.

The motion of the car is taken up by the flexible hose and thus the abutting surfaces are protected from strain or injury. According to the experiments of French engineers the life of rubber hose working under a pressure of five atmospheres of air is equal to eighteen months, and if similar results are obtained with steam hose the expense of renewal will be trifling. The cost of one hose of the standard length, 21 in., is \$1.10.

The wearing surfaces being the inclined curved faces of the lugs and arms that have no connection with the wear upon the gaskets, the latter wear, if at all, by concussion, not by sliding or rolling friction.

THE REGULATING VALVE.

This valve is placed under the floor of each car near its centre and is operated by a key inserted in a disk set in the floor of the car above the valve stem V. A quarter turn of this key makes all the changes required by this system to control the heat in the cars, and by its proper use the heat can be kept uniform and supplied to meet any requirements.

In fig. 6 is shown a longitudinal section. Fig. 7 is an inverted plan, partly in section, and fig. 8 is a transverse section of the improved index valve. The pistons A A' are actuated by a key or wrench inserted in the square hole in the index shaft B by moving the segment C in connection with the raked piston rod D. The pipes that screw into the tapped holes E E' E' convey the steam from the valve to the radiating pipes in the car. With the pistons A A' in position shown in the illustration, supposing the source of steam to be at the right hand of the engraving, the steam enters from the main pipe through the hole X and passes upward through E to the radiating pipes in the car going to the forward end of the car, then to the rear end of the car through pipes along the side of the car under the seats, thence forward to the centre of the car through one pipe, entering the valve through E' E', passing downward, as shown by arrows, and into main pipe through X' and so on to the rear of the train. These pistons are only placed in this position when first admitting steam to the radiating pipes in order to "blow out" the air through the vertical pipes, shown in fig. 1. After all the pipes in the car become warm, the index is turned to any required position between O and S on the index plate, moving the pistons A A'. In this position of the pistons, steam may pass to the radiating pipes by E E' E' to supply space made by condensation. When the point of the index is turned fully to S (shut) the pistons A A' cut off all communication between the holes X X' and E E', thus shutting off steam from the radiating pipes, but allowing it to pass over the bridge H (piston A having been moved to the left) from X to X' and so to the rear of the train, without any obstruction. The water of condensation finds an outlet through a small passage not shown in the engravings, and through the holes J J, which are connected by a $\frac{1}{4}$ -in. pipe to a steam trap I, fig. 2.

On the rear car of a train the wheel N is turned to a point marked on a suitable index plate inside the car, moving the small piston back toward the rear end of the valve or toward the left of the drawing, N being connected to the small pis-

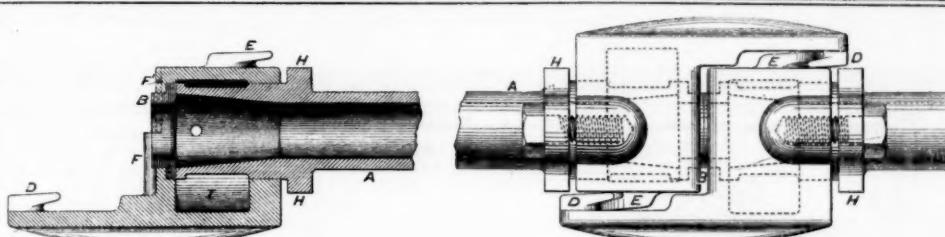


Fig. 3.

Fig. 4.

Fig. 5.

Details of the Coupling.

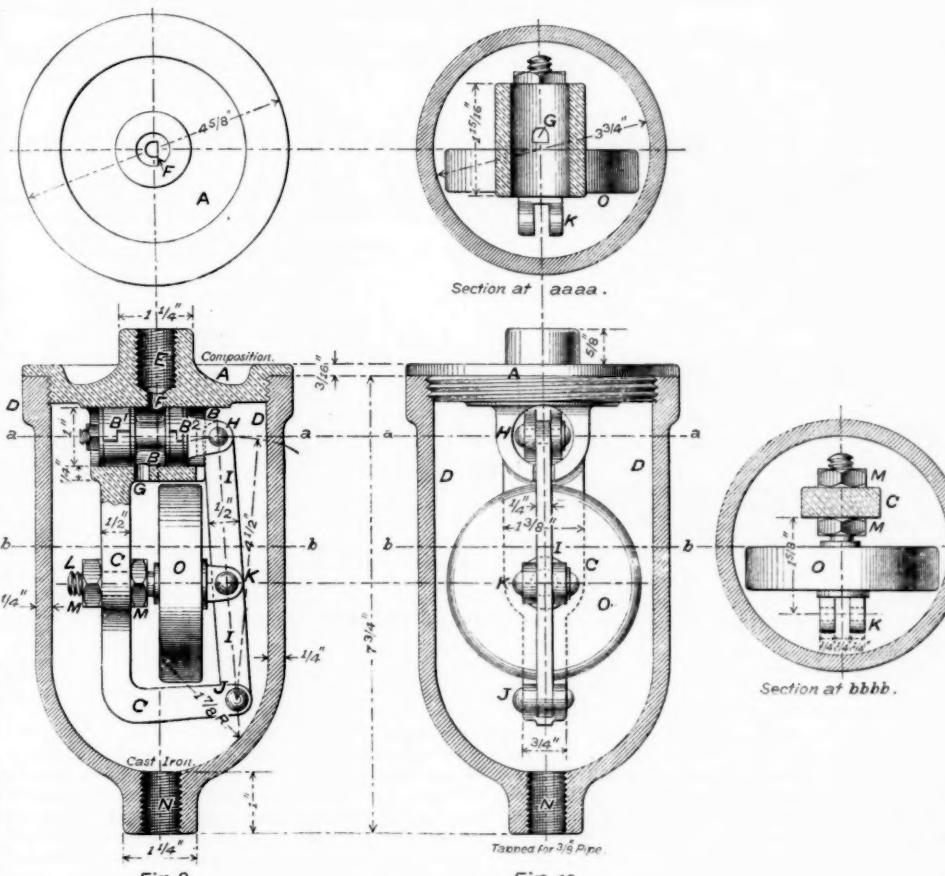


Fig. 9.

Fig. 10.

Details of Steam Trap.

THE SEWALL SYSTEM OF CONTINUOUS HEATING.

ton. All communication to the rear end of the main pipe leading from the hole X, is thus cut off. The condensed water then passes out through hole R to a trap. All the steam in the radiating pipes is thus condensed before it is allowed to escape into the atmosphere.

Should the source of the steam be from the other end of the train, or from the left of the illustration, the current would be in the opposite direction to that shown by the arrows.

The index plates are screwed to the upper side of the car floor and let in flush so as not to present an obstacle to walking or sweeping, and may be made as ornamental as useful. The pipes along the sides of the cars are protected by bronzed monogram screens or wire netting between seats, giving a finished and neat appearance to the fittings.

The highest portion of the distributing pipes is provided with an inwardly opening check valve to permit air to enter when the steam is shut off, so as to prevent the water of condensation from being retained in the pipes by the atmospheric pressure at the drip passage opening. The drip passages open into the closed circulating pipes instead of directly into the air, and the circulating pipes thus drained into act as "blow-offs." Danger from freezing and stoppage of the regulating valve is thereby greatly lessened.

THE STEAM TRAP.

The trap is shown in vertical section in figs. 9 and 10, and in plan and by cross-sections on the lines a a and b b.

The trap consists of a composition casting A, on the under side of which is a small cylinder B, and beneath this again the arm C, all forming one piece and screwing into the cast-iron shell D. The hole E in the top of the casting A is threaded for $\frac{1}{4}$ -in. pipe terminating in a $\frac{1}{4}$ -in. hole F, where it enters the cylinder B. A hole G, $\frac{1}{4}$ in. diameter, passes out of the lower side of cylinder B, and is placed $\frac{1}{4}$ in. to the left of the hole F.

In the cylinder B are placed two pistons, B¹ and B², secured rigidly together and pivoted at H to the bar I, the lower end of which is pivoted to the arm C.

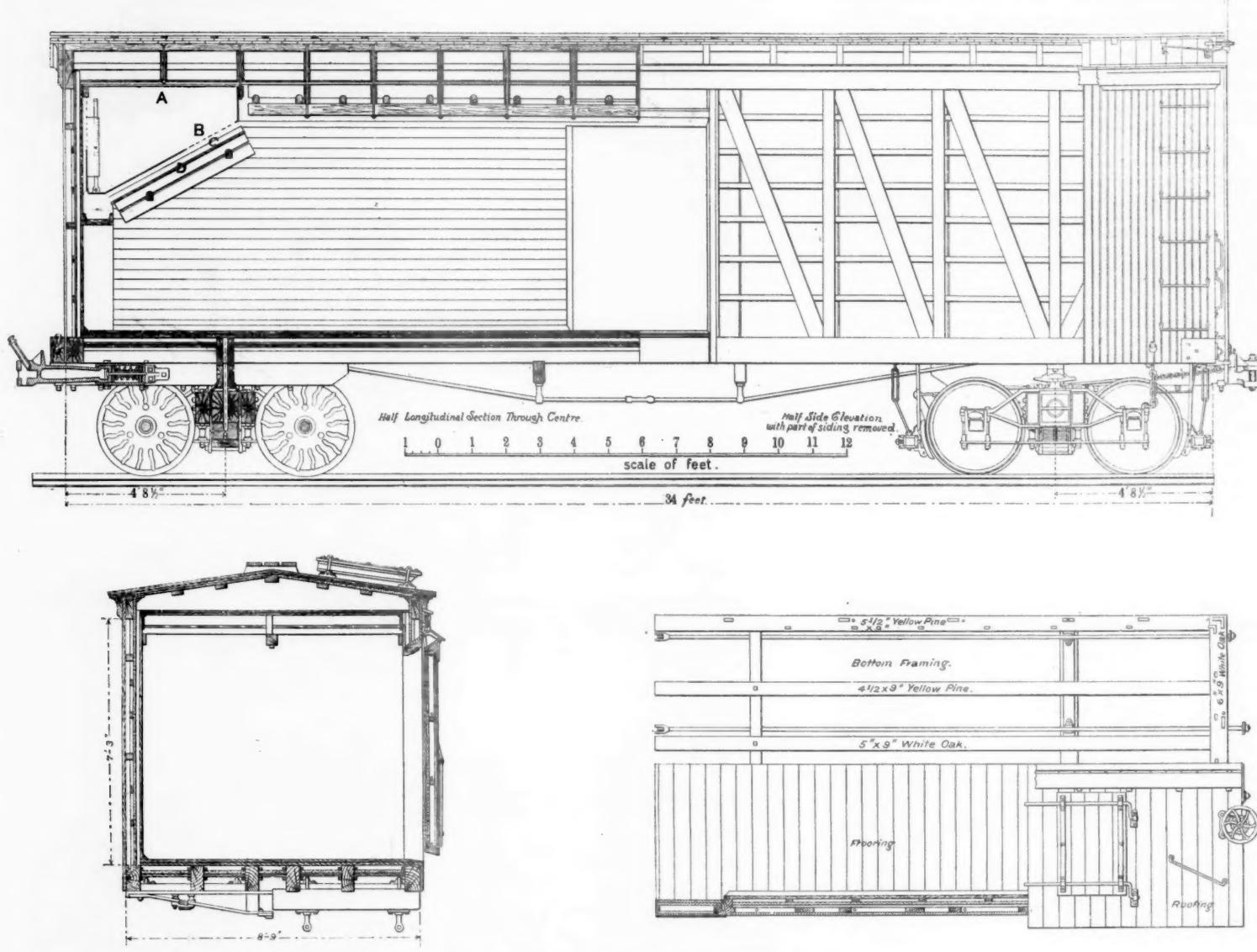
A round case of thin spun brass filled with a fluid that is highly susceptible to changes of temperature, is placed between the bar I and arm C, one side being pivoted to the bar I at K, the other secured rigidly to the arm C by a stud L and adjusting nuts M M. The water of condensation enters at E through F and G, and passes out of trap at N. When steam attempts to follow the same course, the case O is heated and expands, moving the piston B¹ until the hole G is covered, thus shutting out the steam.

As the steam enclosed in the shell D cools, the case O contracts, and the port G is opened and lets off condensed water at any temperature to which the nuts M M are adjusted.

THE AUXILIARY BOILER.

In ordinary everyday use, with the train in motion, the steam for the supply of the radiators in the cars comes from the locomotive, and there is no fire in any part of the train except within the locomotive. When any car is shut off from its supply of steam from the locomotive, by an accident or by being detached from the train and side-tracked, or should a car be waiting on a side track for an incoming train to which it is to be attached, the car or train is heated by an auxiliary boiler or appliance.

This auxiliary boiler, which is best shown in figs. 1 and 2, consists of a small hot well to receive the drip of condensed water from the pipes, having a small fire-box under it with dumping grate, and connected with the piping of the car so that in case the car is set off at a time and place where heating is necessary and cannot be otherwise obtained, steam can be promptly generated to heat the car until it can be heated by attachment to an engine or stationary heating plant. At the pleasure of the train attendant the grate and the contents of



THE ZIMMERMAN AUTOMATIC REFRIGERATOR CAR.

the fire-box may be dumped completely, so that not a vestige of fire will remain in the car. The boiler is cylindrical, and so economizes space that it does not extend below the axles of the trucks, and a small box under the car contains fuel supply for any reasonable time. The supply of steam from this source is controlled by the same regulating valve, which is so constructed that as the supply from the primary source is cut off, the secondary is turned on and vice versa. The auxiliary boiler is not intended to be used in regular work, and as it is placed entirely outside the car, and can only be attended to while the train is at rest, it cannot be conveniently used while the train is in motion. The rigid enforcement of the rule that the contents of the fire-box must be emptied before the train starts, removes any reasonable objection to its adoption as an acceptable addition to the system.

It is claimed that if fire should happen to be contained in the auxiliary boiler while the car is in motion, the four small bolts that support it would readily be broken in case of collision and the boiler would be separated from the car and its contents be dropped outside and ordinarily left with the trucks where the obstacle was first encountered.

The system is the combined invention of Messrs. J. H. and D. D. Sewall, mechanical and locomotive engineers, of Portland, Me., and has reached its present state of development through the slow evolution of practical experience in and upon railway trains rather than through any of the so-called spontaneous conceptions of the day.

The Sewall system is used on the Maine Central, Old Colony, Fitchburg and some twenty other roads. The Sewall coupling is also largely used in connection with other systems. Mr. J. W. Marden, of the Fitchburg, writes us: "We are applying the Sewall system of heat to our cars in preference to any other system now in use."

The Zimmerman Automatic Refrigerator Car.

The transportation of perishable freight has assumed very large proportions within the last few years, and its carriage in refrigerator cars has become a necessary and considerable part of railroad business. The accompanying drawings show the new "Zimmerman Automatic Refrigerator," the invention of Mr. Arnold W. Zimmerman, of Chicago, and manufactured by the Zimmerman Refrigerator Co. of that city.

The practice has commonly been to refrigerate the interior air of the car from sheet metal tanks without provision being made for perfect circulation of air. In this car, it is claimed the warm air is brought into direct contact with the refrigerating material in the tanks, and when thus made dry and cold, it is distributed over the perishable freight.

The liquid formed by the melting ice overflows the perforated metal chamber, extending from the top of the car, the chamber being at all times free and giving a circulation of cold air, and thereby forming a large cooling surface, which receives the warmth from the air circulating towards it from the yet warm material stored in the car, and thereby quickly still further lowers the temperature, and also increases the rapidity of its circulation, removing all dampness and moisture, thus securing a most valuable feature for the preservation of meats and like perishable material, as it is a well known fact that it is the moisture in the atmosphere which is the first cause of decay to perishable freight.

The description given above will be understood by the accompanying illustration, in which *A* is the ice receptacle proper and *B* the wire netting. The motion of the car in transit distributes the brine over the metal surface *C*, as shown above. Beneath the metal surface *C* is another air passage, and then comes an insulated surface *D*. The object of this insulated surface is to further increase the circulation and cooling of the air, and cause it to pass down the passages between *B* and *C* and *C* and *D*. Thus a constant circulation of air is kept up the entire length and breadth of the car.

The ice tank covers are bolted to irons, which at the same time form hinges to the covers, so that they can be placed and replaced, exposing the whole upper surface of the car, and greatly facilitating the operation of icing.

The "Zimmerman car door and lock" is a new and distinct feature applicable to any refrigerator car. It is in use on several lines and on other classes of refrigerator cars. It consists of a single sliding door, which is operated by a lever and moves on rollers in such a manner as to open and close easily. It appears to be simple, easily operated and durable, and free from all the objections to swinging doors.

The Chicago & Alton have adopted these cars as their standard after a careful test. The Zimmerman Refrigerator Co. is building a number of cars for the purpose of allowing all roads so desiring to make a test. Any further particulars may be obtained at the company's office, 5 Grand Pacific Hotel, Chicago.

The Sharpneck Anti-friction Journal Box.

The accompanying illustration represents an application of the principle of anti-friction rollers applied to the bearings of a traverser on the Chicago, Rock Island & Pacific.

A similar set of boxes were fitted up to passenger coach No. 16 on that road in June, 1887. Mr. B. K. Verbrugge, the General Master Car-Builders, and the President of the Master Car-Builders' Association, informs us that "the coach has been running constantly ever since, on both long and

short runs and in trains, making very fast time, and it has stood the test to our entire satisfaction. No oil or packing is used, the boxes require no attention, and there are no hot boxes at any time or under any condition. One man can easily move the coach forward and backward on a level track. The ease with which the coach was moved led us to apply the boxes to our transfer tables, and we have fitted up two tables with the boxes. One at our shops at 51st street, Chicago, and one at shops at Horton, Kan., both of which have fulfilled all of our expectations. The saving of power is very great, and one man can propel the table easily.

"Our company is so well satisfied with the performance of coach No. 16 that we are now preparing to equip a whole train with the device."

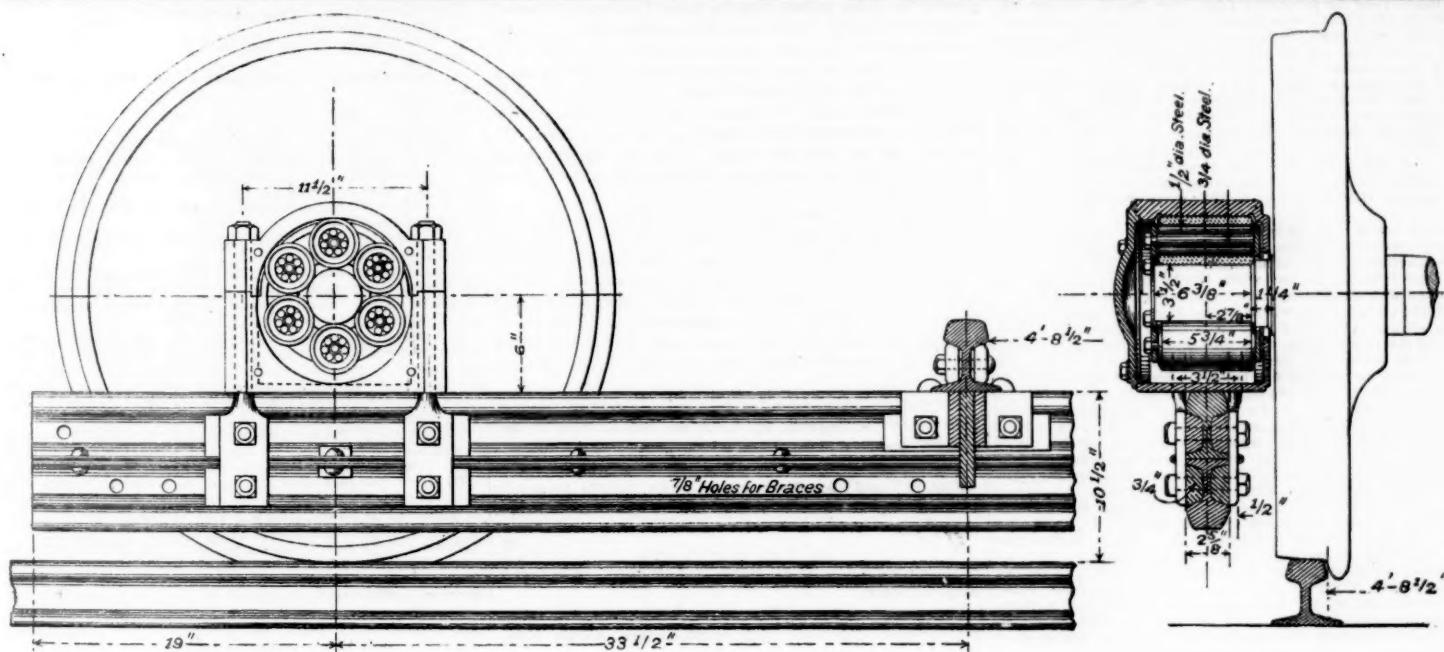
The mechanical features of the device will be easily understood from reference to the engravings.

New England Railroad Club—Frogs and Switches.

The regular monthly meeting of the New England Railroad Club was held Jan. 11, 1888. President Lauder occupied the chair and announced the subject for discussion for the evening as "Frogs and Safety Switches," and stated that the discussion would be opened by Mr. George Richards, of the Boston & Providence Railroad.

Mr. RICHARDS: The story of the switch and the frog, like the story of the locomotive and the railroad, originated at the famous trial at Rainhill, in October, 1829, previous to which both the locomotive and the railroad were crude affairs, though a few locomotives were in use and doing fair service, one of which commenced in 1813 and ran till 1862, * * *. After October, 1829, the rail took on some definite forms, such as the T and H rail, the inverted U, the fish-belly, the bull headed and double-headed. The split switch soon followed as by evolution. These switches were called points, and the men operating them were called pointsmen. Leading switches and their frogs were termed facing points. To make the switches safe, devices were attached in such manner as to allow them to be opened by the passing wheels in case of misplacement. A common form of movement was a bell crank, the points being attached to one arm, a weight to the other, and the weight held the points to the main line and forced them back, when opened by the wheels which passed from the turnout. The points were held to the siding by hand levers. It was a safety switch in every sense of the word. This arrangement has been used in this country to some extent within a few years, and possibly patented. Its first use on English roads was more than 40 years ago. One point was often made longer than the other, thus allowing the wheel to reach the stocky part of the rail before the hardest part of the work commenced. Point switches covering three tracks were quite common on roads abroad 30 years ago, but are not advisable where two switches can be used.

Soon after the Rainhill trial the railroad mania crossed the Atlantic. Only three cities then had a population which would fill a large church, and money was not plenty, and the railroads were of necessity built in a poverty stricken manner. But little now remains of the early railroads. The stub



THE SHARPNECK ANTI-FRICTION JOURNAL BOX APPLIED TO A TRAVERSER—CHICAGO, ROCK ISLAND & PACIFIC.

switch was the natural outcome of the early poverty. It could be made without expensive materials and in a country smith's shop. Increased traffic, with its risks, called loudly for a safety switch. One of the earliest was that brought out by Tyler in the forties. He applied castings to the rails and made a safety switch of the old stub. * * * It is no longer a good safety switch. Soon after that an attempt was made to introduce a split switch that failed. Then came the Wharton switch, that started out rich in promise, but the lack of uniformity of wheel gauge soon required it to be discarded. Then there was a variety of switches which were attempted to be made safe, without success, among them the White switch, which had the fault of placing too much strain on the stand and connections, and with slight errors of wheel gauge it would send the flanges of wheels the wrong side of the point. The split or point switch came at last, but was a partial failure through bad construction of stand connections, but with improvements in that direction it is a success, and, like the mother-in-law when she appears with her trunk, has come to stay.

REQUIREMENTS OF A SAFETY SWITCH.

The qualities of a good safety switch are as follows: It should be a split switch; it should never be a leader on the main line, if otherwise practicable; it should always snap to one side or the other as the wheels pass through, never stopping midway; it should never show the signal of "all right" until clear over and fastened, and should not take severe strain on the guiding rail before the wheel is well on to the full size of the stem, or take the load before the wheel reaches that part which is able to bear it. In many cases switches are made leading where they need not be, and nearly all the disasters from broken wheels, loose wheels and loose guard rails come from leading switches. The report is that the disaster of yesterday at Haverhill was one of that kind, that a flange broke off the wheel, and for lack of that piece of flange the wheel went the wrong side of the point; being a leading switch and the flange broken, the wheel went that way.

FROGS.

The story of the frog is much like that of the switch, from plain cast iron to castings plated with wrought iron; from that to castings with steel plates, and then to some kind of rail frog. Bolted, clamped and riveted rail frogs all have their good points and their bad ones. Rails, if hard enough for long service in a frog, would break when used as rails. Something better is wanted than the rail frog, and may be found in time. Spring rail frogs should be so secured that the opening on the moving side can never be too large. No two frogs should be laid on the same line with the points exactly opposite, otherwise they will sometimes cause these so-called mysterious derailments. If the wheels can safely pass round the sharp curves so often laid for them, they will stand the slight irregularity caused by placing the points other than opposite. Frogs and switches have harder service to the same number of wheels here than abroad. Some American passenger cars weigh over 80,000 pounds. On English railroads 200 passengers and their baggage are often carried in cars weighing little more than that, and often less. The weight of the locomotives has nearly reached its maximum, which seems to be fixed by the limited room for the boiler. Of course the destruction of frogs and switches, or their durability is connected with the weight of the trains, which is constantly increasing. The rail must soon reach a weight of 100 pounds per yard, and rails of this weight are now in use.

The PRESIDENT. I am aware that a spring frog is not desirable under all circumstances, say at a terminal point, where an immense amount of switching is done; but where there is not much switching and high speed is required, I think it comes in to good advantage. I would have been in favor of the spring frog, because we can ride over it without feeling it. I would like to hear from Mr. Patch, of the Connecticut River road, what his experience has been with the spring frog.

Mr. PATCH: In 1872 the Connecticut River Railroad put in 20 spring rail frogs. One which was put in at the north end of the Chicopee freight-house track has been in the same place ever since until day before yesterday. I don't think one cent has been laid out on it, and it hasn't been out of the track except to put in new timbers. I think any other kind of frog ever made would have had to be replaced five times in that time. So I think I can safely say that a spring rail frog, properly made and properly put in, is five times the value of any other frog. I should prefer to put it wherever there is a main track.

Mr. CLARK: The condition of the tires governs that matter more than the weight. All the frogs destroyed that I ever took out had been destroyed by the tires, the points never having been battered by the weight.

Mr. RICHARDS: It has been found that the tires on the

lighter locomotives wear faster than those on the heavier ones, on account of slipping, which more than counterbalances the extra weight in the wear of the tire.

The PRESIDENT: I agree with Mr. Richards that the tires on the heavier locomotives wear better than those on the lighter ones, because they do their work without slipping. Mr. LANE (New York, New Haven & Hartford): After trying a number of different kinds of frogs we put in at different points some of the rail frogs, and they have given great satisfaction on our road; some which were put in at Windsor Station seven years ago, where fast express trains pass, are in excellent condition to-day, and will probably remain there as long as the rails to which they are coupled. On the Hartford division we have something over a hundred spring rail frogs, and we have not hesitated to put them in place of others that have been taken out. We find those of the later make are better than the earlier ones. I think a split switch properly laid is as good as anything in that line that I know of.

GUARD RAILS.

The PRESIDENT: There seems to be a difference of opinion among railroad men as to whether guard rails in front of split switches are of any use. I am inclined to think as a general thing they are not, except perhaps in the case of a loose wheel; but I can hardly conceive of a wheel being so loose as to catch on the wrong side of the switch point and remain on the rail. As a rule I think the disasters caused by running against the points of a split switch are perhaps from neglect, that from some cause the point fails to seat itself against the rail firmly, and then a sharp flange might catch and produce trouble. Then will guard rails in front of switches prevent such an occurrence, as they are usually put? I hardly think they would, because you cannot get them close enough to the main line to make them guard rails under ordinary circumstances. Mr. Mansfield has designed a guard rail and I would like to have him explain it.

Mr. MANSFIELD: * * * It doesn't seem to me that a full-flanged wheel is dangerous running against a point, but I think a sharp-flanged wheel needs to be held away from running against that point, and the question is, can it be done in connection with the automatic split switch? The common form of guard rail is about 8 ft. long on each side before the point of the switch. But to serve the purpose I speak of, to keep the sharp flange away from the main rail, and therefore keep it from splitting the automatic switch, it is necessary that the guard rail should be at such a distance from the main rail as to fulfill that function; that is to say, perhaps an inch and three-quarters; and yet from a pretty careful examination I think it may be safely placed a little nearer than that to the main rail to accomplish that object, provided the track is 4 ft. 8 1/2 in. wide, and the wheels only allow a lateral motion of half an inch. Mr. Mansfield then showed on the blackboard, and explained his movable guard rail which was illustrated and described in the *Railroad Gazette*, Dec. 9, 1887.

Mr. W. F. ELLIS, of the Providence & Worcester, read the following paper: I think the cast-iron, wrought-iron and Mansfield frogs are of the past, and the steel rail frogs for safety and economy, should now be used on the main track, and also in renewals on side tracks where very much switching is done. * * * I have had spring rail frogs in use for two years only, and with satisfaction. My opinion in regard to them is not worth much in comparison with that of those who have used them for 15 years. As my road, the Providence and Worcester, is quite crooked, with a good many frogs and switches on the inside and outside of curves, I have objected to the use of the bolted or riveted frog, using the clamped or yoked. * * * The length of the frog should be such as to allow easy bolting to connecting rails. (Where made at frog works, a No. 9 frog will be 9 ft. long, when it should be at least 10 ft.; 12 is better.) The flangeway between wing rails and point rails should be 1 1/2 in., yet, at the throat or wing vertex of the frog, for a No. 9, I would have the flangeway 2 in., and the rails at the wing vertex should have a curve, and not an abrupt bend, which is put in at some frog works to get the 1 1/2-in. flangeway, the rails not being heated to put in this curve, which leaves the steel in better condition for service than if heated to get the abrupt bend; and the rails thus curved at the throat or wing vertex get only a light blow from the wheels passing through them, thus saving wear. The ends of the wing rail toward the heel of the frog should not have an abrupt bend, but should curve from the 1 1/2 in. flangeway to 3 1/2 in. at the end in a distance of 15 in., so as to give a glancing blow to any wheel that might strike the same. For we should not forget that there is an endeavor on the part of the wheels to stir up a conflict between the rails of the frog and its guard rail, and any unnecessary strain on either works to their disadvantage and against their life, and also that of the wheels;

toward the heel from the point of the frog. The blunt point should be 1/2 in. thick at the end for frogs that have a good deal of wear on both sides of point, and 1/4 in. thick at the end for frogs that have the wear on one side of point, producing same toward the true point as the angle of the frog calls for it. I am not an advocate of the wing rails to be interchangeable. When a frog has been in use so as to have worn the wing rail on one side where the blow of the wheel strikes it in leaving the point of the frog on a double-track road, the point is worn down in height somewhat, and when the wing rail is shifted around we do not get a good riding frog. The better way is to never wear on the main track a rail frog so that you can put it in on a side track in such a position as to get the principal wear on the wing rail not worn; and I have even shifted them around on the main track so as to prolong the life of the frog. In conclusion, have each frog, when new or repaired, lined up with a string or straight edge, and see that it is in good line. I prefer the 1/2-in. blunt-point frogs to be chamfered off a scant 1/8 in. from the true line at blunt point alone. After placing your frog in the main track in a good line with the main track rail, in the curve of the lead from heel of switch to the frog leading to side track, put in this curve so as to allow a straight line with the frog toward the switch for 6 ft. from point of frog, thus to help to right the trucks. See that good ties, not too far apart, nor allowed to remain too long, be used; that as few sharp flange or guttered tread wheels go through as possible; that when any switchman or trainman knows of a derailed car being off or drawn through the same, the Road Department be notified.

THE SPLIT SWITCH.

* * * The White switch, when used for a trailing switch, is a safety switch every time that you run through it wrong, and it is the most economical switch in snow and ice storms; but, owing to the chance of switching against the point, of a loose wheel going the other side of the point, thus making a bad wreck, it is condemned by some roads.

The split or point switch, as it is now made, depending on its automatic action in the stand, and not, as formerly, on the spring between the rails, is, in my opinion, the safety switch for present use. It has no open joint to be pounded in winter or become tight in summer. It gives such a good bearing for the wheels of cars that one does not notice it in passing over. There is no strain to cause a broken switch frame or bent connection rod, as the strain comes against a rail well braced up on the outside. And it is not perceived when you pass through it in a wrong position, as the point rails move so quickly and easily by the forcing of the spring in the automatic stand as to throw it in the right position when the wheels crowd the point rails between the third and second switch-rod, where there is stock enough to bear the strain. The first cost of a split switch and automatic stand, as compared with the other safety switches, is in its favor. For instance, the cost of a Tyler is \$70; Cooke, \$90; Wharton, \$125; White, \$130; split, \$58. At the end of three years of maintenance, a Tyler will have required repairs on lost motion of rods, broken castings, and the crippled ends of the rails at throw of switch, with a fracture in the same; on a Cooke, the same repairs, except no broken castings; on a Wharton, the main rails will be as good as any in your main track, but if it has been used on the side track, there will be a broken switch, with loss of material and labor through derailments. On the White, there will be required renewal of point and rail on one side of switch; otherwise there will be broken flanges of wheels through non-renewal. On a split switch nothing will be required except the inspection due any switch.

In my endeavor to claim the split switch as the safety switch, I should say that it should be made similar to the Boston & Albany split switch, as now made at their Springfield shops: the connection rod to be 1 1/8 in. square, the head switch rod 2 1/2 by 3/4 in., the other switch rods 2 1/2 by 3/8 in. to use a forged or steel clip, which is to be bolted to the web of the point rail; the switch rods to be bolted to the clips, so as to be not rigid as regards creeping of the track; the centre of the switch rod to be 9 or 15 in. from the end of the point rail, according to the stiffness of spring of the automatic stand in use; the other switch rods, three in number, 24 in. centres; the guard rail braces for the slides to be of wrought iron or steel. In addition to the ten slides that are generally used, I would use two more under the point rail that is in use when set for the main track, the points at the end to be planed so as to lie 1/2 in. below the top of the main rail; the upper side of the switch rods to be nearly level with the top of the ties; the throw of the switch to be 4 in. at centre of the head switch rod, with 5 in. sprad at heel, gauge to gauge. I speak of wrought-iron or steel braces to be used instead of cast-iron, from this incident: Within the last month one of our freights backed over on another track for a passenger train to pass, and in crossing back a car that did

not curve rode the point of a frog, one truck getting off, which derailed truck was drawn through two split switches, along the track, until it struck a wooden guard rail at a four foot culvert near a Tyler switch, which guard rail threw the truck around close to the main rail so that it rode the switch on to the track all right. Two trains passed over these switches before it was discovered that a derailed car had damaged them. Every cast-iron brace was broken; the wrought-iron were not, for I put more braces than go with the slides to the point switch. By the use of split switches we can do away with three-throw switches, which are the most liable to mistakes in throwing them, by using a 15-ft. and a 10-ft. point on the main track near each other.

By the use of split switches we can, with the slip switch arrangement and the use of crossing frogs, cross from one main track across the other main track to side track, and also cross between the two main tracks, having only trailing switches used on the main track and economize room, or as I am doing on my road, where I cross from one main track to the other and then out of that main track to the side track. Placing the points of the two switches on the main track, you cross with only four feet between the points, which makes nearly a straight line from the heel on one switch to the heel of the other when set to cross over the main track to side track from outer main track, thus economizing room and securing better riding for switching purposes. If a road has the U. S. & S. electric signals in operation, by the use of the split switch it does away with two insulation joints, some ground wire and places the switch box in a better position for successful working than with any other switch.

As to the objection that the split switch cannot be used in snow-storms and icy weather I cannot speak fully, as on our road we have no heavy storms; but I think that a little salt, brooms in the engine and on the engine, and a little patience on the part of the trainmen to get snow and ice out by the points, if trackmen are not there, some more labor employed in the winter in the road department, and a more careful preparation by the trackmen before winter sets in by digging out between ties where switch rods are giving good drainage to the same, will obviate this objection somewhat. But I would not advise any road afflicted with heavy snow-storms to put in a large number of split switches until by practical use of a few the matter can be tested. * * *

Objection is made that a stone may get between the point and rail, so that when it is thrown the point will be left out. There have been stands used that would allow this, but automatic stands are used to-day where you cannot get the handle down to lock it when the point does not fit up to the rail. * * *

I do not condemn a split switch that wheels do get off of, until an investigation shows whether the throw of the stand agrees with the throw of the switch. Sometimes the wear of the parts and the gauge of the track are neglected so as to allow an opening between the point and the main rail of as much as $\frac{1}{8}$ of an inch; and, in the haste of switching, the points may be thrown between the trucks of a car, or between two cars of a train, causing derailment, and damaging the parts so as to interfere with the successful movement of the switch, and it may escape the notice of the trackmen.

WHEEL BASE OF TRUCKS.

Mr. COLEMAN: If there was a long rigid wheel base frogs would not be often hit. The shorter the wheel base, the more any obstruction throws it round, and one corner or the other is continually cutting into the track. I would ask if with cars with six-wheel trucks there would be the same difficulty about frogs that there is now? There is no question in my mind, looking at it as a mechanical principle, that if you have this short base there will be wobbling about, and the right sort of frog is one that presents a continuous line, and it seems to me that is the reason why those work the best. If we had long trucks, almost any kind of frog would do on the main line.

Mr. DAVIDSON: In running your six-wheel, long-base truck would you have flanges on all your wheels? If so, on a straight track I think you would be all right, but with a track not straight I think it would not be much of a success.

Mr. ADAMS: On our road we have no difficulty in running the longest 6-wheel trucks; I do not know of any running longer than ours. I think Pullman makes his truck base 10 $\frac{1}{2}$ ft. We have some 11 ft., and never had any difficulty in running with flanged wheels, and we have some sharp curves. At the same time, with a long wheel-base it does not necessarily follow that we put in six wheels. Experience has taught us that a long truck is easier to run than a short one, easier for the track and for the car.

The PRESIDENT: We have had on our road 8 and 10 ft. base trucks running for years, with a soft steel tire, without perceptible abrasion of the flanges. I think, as a general thing, we should lengthen out our wheel-bases; we have been working in that direction for years.

Mr. ADAMS: Some persons think it is necessary to have a wheel without a flange in a six-wheel truck, or a longer journal. We tried the experiment of putting in the middle wheels without flanges in some of our cars, and they got so hot we were obliged to return to the flanged wheels, and we had no further trouble. On a fast train a flangeless wheel is a poor thing. * * *

The President announced as the subject for discussion at the next meeting, "Axles and Wheels, and their relation to the Track."

The McElroy System of Continuous Heating.

The accompanying engravings show a new system of applying the principle of continuous heating to cars fitted with the Baker heater. The appliances shown in the illustrations have just been fitted to the directors' car on the Delaware & Hudson.

The steam from the engine passes as usual through a reducing valve to a continuous pipe running the length of the train. The principal novel feature of the system is the method by which the steam from the engine is injected into the water in the pipes of the Baker system. The means by which this is effected is shown in figs. 3 and 4, the latter being a general view and the former a detail view of the pear-shaped vessel in which the current of steam from the engine is broken up and, it is claimed, noiselessly mingled with the water in the Baker system.

The pear-shaped vessel D, shown in figs. 3 and 4, is of cast-iron, and is inserted in the circulating pipes of the Baker system, which enter the vessel at the bottom and pass out at the top, B'. A jet of steam is introduced by means of a perforated pipe E on the right-hand side of the illustration, and forces its way through a mass of gravel, which will pass through a mesh of 3 to the inch, but will not pass through a mesh of 4 to the inch. The object of the gravel is to destroy noise, which appears to be effectually accomplished. It is claimed that a circulation is rapidly set up in the

pipes of the Baker system, and the water is completely heated in about 7 minutes. If the steam is turned on when the Baker pipes are empty, the steam condenses and fills the pipes with water in about an hour and twenty minutes, the car being kept warm while this process of condensation is going on. It is not proposed to use salt water with this system, as the mixture of condensed water would soon render it fresh. If the car has to stand any length of time the pipes would be emptied and the car would soon be warmed after the locomotive was attached.

The main pipe conveying the steam from the engine is shown at F, fig. 1. The branch pipe E conveys the steam to the pear-shaped vessel on each car. The usual circulating pipes of the Baker system are shown at A, and the cock for emptying is placed at the lowest point U. The pipes of the Baker system will fill with condensed water up to the top of the pipe K running from the usual tank on the top of the car. The water overflowing down this pipe is let off by a Curtis trap.

The general arrangement of the coupling between the cars is shown by the diagram, fig. 1, and an outside view of the coupling is shown in fig. 2 and a longitudinal section in fig. 6.

Figs. 5, 7 and 8 are detail views of the handle by which the coupling is effected and locked in position to form a tight joint.

It will be seen that when two cars part, cords or chains attached to the handles cause the coupling to separate without injury.

The coupling is a straight coupling, with two vulcanized gaskets butted together. Both couplings are exactly alike, and they are firmly clamped together by two revolving rings, furnished with handles, grooves on the rings bearing against cams or interrupted screw threads on the coupling.

The method of clamping the hose is shown in figs. 9, 10 and 11. It will be seen that three holes are made in the hose, and that corresponding pins on the segments shown in fig. 11, enter these holes and so prevent the hose from blowing off.

When the system starts it is claimed that all the air is blown out by the steam, and the inventor states that his experience has shown that condensed water, free of air, will not freeze until the temperature falls to about 22 degrees Fahr. above zero. The price of the apparatus fitted to a car is \$175, complete with hose and coupling. It can be fitted in one day, and the pear-shaped vessel weighs about 50 lbs.

Any further information can be obtained from the McElroy Car Heating Co., Detroit, Mich.

Western Railway Club.

An unusually large attendance marked the January meeting of this club, which was held on Wednesday, at the Grand Pacific Hotel, Chicago. On account of the recent death of the son of Mr. Verbrück, that gentleman could not be present, and the formal report of the committee on standard axle for a 60,000-lb. car was not presented. Mr. C. A. Schroyer (Chicago & Northwestern), for the purpose of opening the discussion on that subject, read the communication of Mr. Forsyth (C. B. & Q.), recommending as the standard an axle of the following proportions: Length, 6 ft. 11 $\frac{1}{2}$ in.; distance between wheels, 4 ft. 0 $\frac{1}{2}$ in.; journal, 4 $\frac{1}{4}$ x 8; dust guard, 2 $\frac{1}{2}$ x 4 $\frac{1}{2}$ in.; diameter of wheel seat, 5 $\frac{1}{2}$ in.; diameter of axle at centre, 4 $\frac{1}{2}$ in.

Messrs. J. N. Barr, (C. M. & St. P.), Rhodes (C. B. & Q.), John Hickey (Milwaukee, Lake Shore & Western), Wm. Forsyth, George Gibbs (C. M. & St. P.) and Mr. Nicholls participated in the discussion, each concurring in the recommendations, except as to diameter of axle. Mr. Barr suggested that rather than change the proportions of the present standard axle it might be well for considerations of safety to adopt a six-wheel truck for freight service; the subject should be well considered before any decisive action is taken. It was therefore moved that Mr. Barr favor the Club at the February meeting with a paper on that subject. This he consented to do, and the axle question was laid over.

Mr. Geo. A. Gibbs, Mechanical Engineer of the Chicago, Milwaukee & St. Paul, then read the following paper:

WATER FOR LOCOMOTIVES AND PRACTICE IN WASHING OUT BOILERS.

This important subject should be discussed from a practical rather than a scientific standpoint, as we are not so much concerned with the causes of the little understood reactions and combinations of the elements constituting various impurities in waters, as with the question, "Which waters shall we use and which avoid?"

This question is of the greatest importance to western roads where the possible train load is not only determined by the usual elements, the grades, locomotive weight and proportions, etc., but by the quality of the water obtainable and care bestowed upon the inside of the boiler. The following outline of the method of handling the water problem upon the Chicago, Milwaukee & St. Paul (which offers a great variety of conditions), may prove useful to others.

We have for the past two years been busy upon the systematic analysis and classification of all sources of water supply available, taking divisions giving most trouble first. As soon as a very bad water is found, inquiry is made as to other possible source in the vicinity, and these are then analyzed, and it has frequently proved advantageous to abandon the first station wholly for one nearer good water.

Our company has in former years spent large sums in boring artesian and "drive" wells many of them 1,200 to 1,500 ft. deep, under the mistaken impression that the deeper the source the purer the water. In nearly every case the money has been absolutely thrown away. A clear sparkling water usually means one more or less contaminated with mineral impurities. Surface water from swamps, ponds and small streams, although foul smelling and generally unpromising looking, forms in Iowa, Minnesota and Dakota our best source of supply. Surface water is largely the result of recent rains, and has only absorbed a relatively small amount of salts from the soil, while water from deep seated springs and wells is derived from slow percolation through long distances, the water becoming more and more nearly saturated as it flows.

Varieties of water may be classified by either of two methods:

1. Chemical composition.

2. Effects in use.

The second is manifestly what is wanted by those in charge of locomotives.

The following may be placed in Class 1:

a. Alkaline waters.

b. Non-alkaline, bad and good.

Class 2:

a. Those causing foaming and corrosion, but] non-incrusting.

b. "Hard," or incrusting.

c. Soft, non-alkaline and good.

These two classes are related as follows: "a" of Class 1, "alkaline" waters, would produce the trouble mentioned in "a" of Class II., that is, foaming and in certain cases corrosion.

"b," the bad "non-alkaline," would be classed as "hard" or "incrusting."

"c," "soft waters," would include all those having little mineral impurities of any kind.

It is, however, impossible to set hard and fast limits for each class, one generally shading into the other, and what would be called "good" water in the West, for instance, would be thought poor enough in the East.

In making an analysis we group all ingredients broadly under two heads, "incrusting" and "non-incrusting." Under the former we put such salts as are thrown out of solution by heat, and in the latter those which do not precipitate until great concentration occurs—a condition which hardly ever happens with locomotives.

The action of the incrusting matter is confined to forming a hard shell over surface of flues and sheets, with the well-known hurtful results from overheating, etc.

In the "non-incrusting" groups are found, however, a number of actions: 1st. A well known property of alkali in water is to cause foaming and priming, when sudden reduction of pressure occurs upon opening of throttle. At just what point this action begins to be apparent depends on a number of circumstances. With a boiler overworked and foul from mud, it appears sooner than in one having ample heating surface, with moderate train load, uniform resistance and consequent regular consumption of steam, and with plates free from scale and grease. For a maximum allowable with good results in service, and in the West where really good water, as I have before mentioned, is uncommon, I have taken 50 grains per gallon of alkaline salts. When this figure is exceeded it certainly pays to institute a regular search for better water.

Now, with these non-incrusting salts are associated a number which are readily decomposed in contact with iron, and attack it, causing gradual corrosion. These are most commonly the chlorides and sulphates of magnesia, a very small amount of which condemns the water, say 10 grains per gallon. Organic matter is supposed also to have this action, but in the presence of alkali, I do not consider the danger great, and, with frequent washing out, little attention need be given it.

As to how much scale-forming matter shall we allow, this again should be governed by circumstances; in limestone districts and the far West we are forced to put up with what we have, but ordinarily the figures would be about as follows:

1 to 10 grains per gallon soft water.
10 to 20 " " moderately hard water.
Above 25 " " very

On the Chicago, Milwaukee & St. Paul we employ a boiler compound in all cases; this makes us reasonably independent of the amount of incrusting matter present.

We can deal with great success with waters having 35 to 40 grains incrusting matter per gallon, provided no alkali be present. I make the above reservation because our compound is itself an alkali, so in adding it to a water we must have a care not to bring the total alkali above, say, 50 grains, or we begin to have trouble from foaming. In the "Report of Analysis" blanks we give directions fixing the amount of compound to use in each case.

To conclude this part of the subject, I will give a few examples of the different kinds of water found on our road, illustrating the distinctions above drawn. The best is surface water in the forest region of Wisconsin; for example, that from the well at Wausau:

	Gr. per gal.
Total solid residue.....	6.78
Incrusting matter { Oxides, iron, etc.....	0.23
{ Carbonate of lime.....	2.10
Sulphate "	0.56
Total.....	2.95
Non-incrusting matter { Organic and volatile.....	3.15
{ Alkaline chloride.....	0.68
Total.....	3.83

For all practical purposes this water could not be better, the incrusting matter, about 3 grains, being inappreciable.

For a good example of badly incrusting water but non-alkaline, the following from Lennox Creek, Dakota, may be given:

	Gr. per gal.
Total solid residue.....	10.90
Incrusting matter { Carbonate of lime.....	40.31
{ Magnesia.....	7.17
Total.....	47.48

	Gr. per gal.
Organic and volatile.....	14.34
Magnesium sulphate.....	46.07
Alkaline chlorides.....	1.31
Total.....	61.72

This water could not be properly purified by the addition of caustic or carbonated alkali without introducing an inadmissible amount of the latter, as above noted.

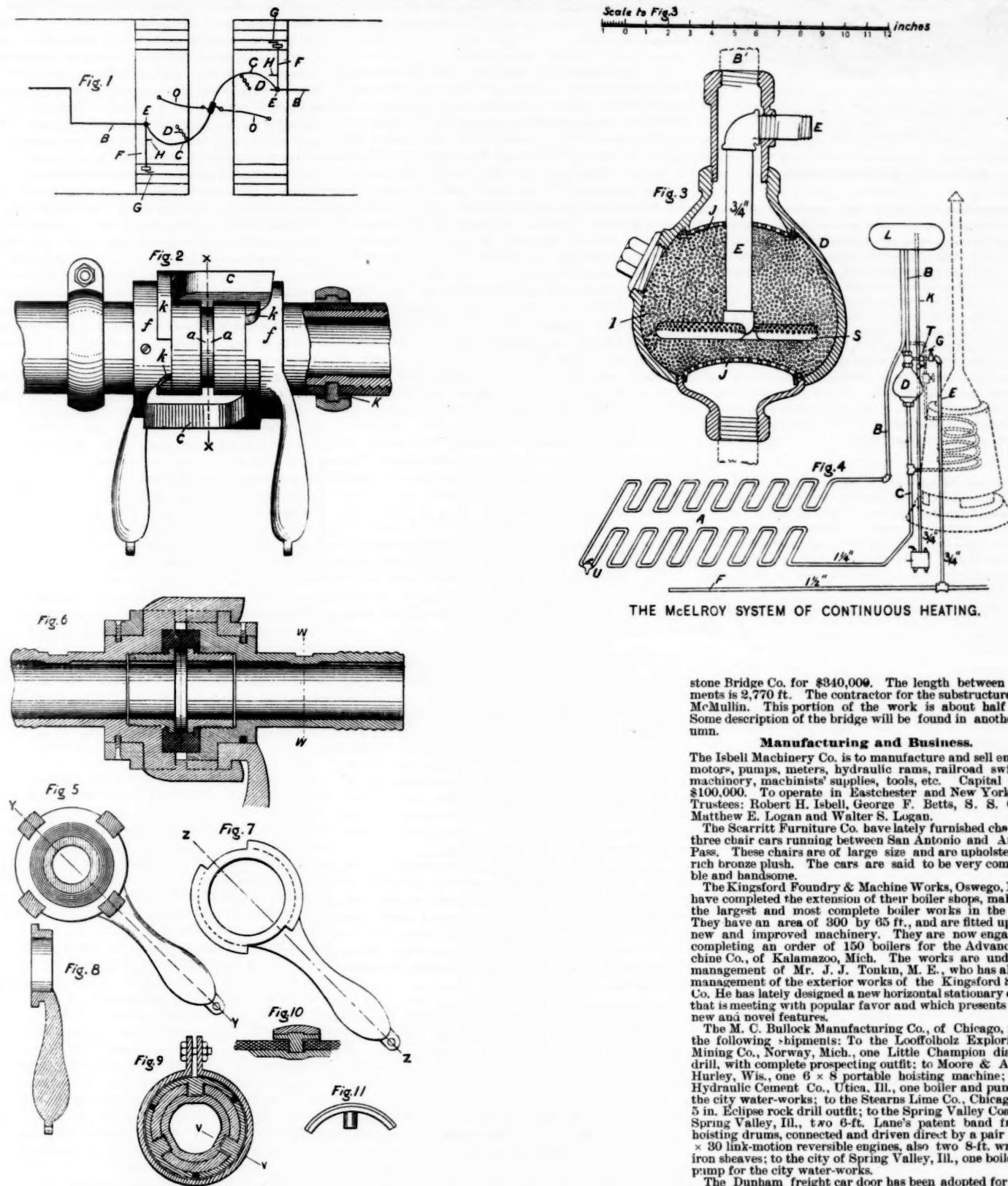
It will be noticed that I have classed the magnesia sulphate as "non-incrusting" matter. It is, however, much more hurtful than the lime salts on account of its corrosive properties. The organic matter is also high, but not more so than is usual by a surface water of this quality.

For examples of absolutely worthless water we may take, first, that from our artesian well at Kimball, D. T.

	Gr. per gal.
To a solid residue.....	182.06
Incrusting matter { Carbonate of lime.....	61.85
{ Sulphate of lime.....	41.41
Total.....	163.20

	Gr. per gal.
Alkaline sulphates.....	64.83
Alkaline chlorides.....	13.94
Total.....	78.77

	Gr. per gal.
Sulphate of magnesia.....	20.90
Alkaline sulphates.....	150.92
Alkaline chlorides.....	1.14
Organic and volatile.....	23.42
Total.....	196.38



It is manifestly useless to attempt the purification of these waters practically.

Taking up the matter of "washing out" boilers, it is clear that without proper facilities for doing so regularly, we should very quickly be in a bad way where the water is so poor as that found in the Far West.

All our round-houses are provided with hydrants and high pressure steam connection for the purpose of obtaining a powerful stream of hot water for washing out use.

On eastern divisions, locomotives having run from 1,500 to 2,000 miles are blown off at low pressure, cooled, and the stream of hot water thrown in at hand holes, front tube-sheet and back head and scraper worked in and out. The sediment is found mostly loose and in the form of fine mud, to the amount of 10 to 15 buckets full.

After thorough cleaning the boiler is again filled with hot water and is ready for service.

On the western divisions we have to increase the frequency of washing out, doing so as often sometimes as once every 300 or 400 miles run. As to the economy of using hot water always, there can be no question: we are saving fully 75 per cent. in number of cracked fire-box sheets by this practice alone, and have been able to materially reduce our force of repairers in round-houses, notwithstanding a very large increase of engine mileage.

I presume many here are opposed to the use of chemicals in boilers, rightly upon general principles, but when the proper ones are used, our experiments have failed to show the slightest injury thereto, while the economy resulting both in service and repairs has amounted to an enormous sum on our system.

In the discussion Messrs. Sinclair, Frank C. Smith, Brown (C. B. & Q.), John Hickey and Forsyth spoke. Mr. Sinclair thought the subject in crying need of consideration at the hands of the railroads, but was sorry so little advance had been made in years past. It was the duty of the

mechanical departments of roads to impress officials with the idea. There was a system of distilling bad waters in use at Manchester, England, which he presumed could be applied here successfully.

Mr. Rhodes thought the motive power departments ought to make the necessity of good water apparent to superintendents, and educate them so that they would obtain the best waters possible. He believed there was a limit to the size of tender, and if that part of the engine was enlarged to prevent too frequent stops, it was very annoying to be delayed by hot boxes in consequence of such enlargement. It was a simpler matter to scoop the water while running, if the supply were looked after as to quality.

Mr. Gibbs said he had found superintendents as anxious to remedy the evil as anybody, and by having samples of waters in different localities sent to the chemist for inspection before permanent arrangements were made in such localities, good results had been obtained by his road, and especially on the lines built last year.

Mr. Brown (C. P. & Q.) presented statistics showing the quality of waters found at 148 stations on his road, and concurred generally with Mr. Gibbs. He recommended careful selection rather than treatment of water as the best course to adopt. On account of the lateness of the hour, Mr. Herr's paper on "Magnetism" went over to the next meeting.

TECHNICAL.

Locomotive Building.

The Pennsylvania Co. has ordered 20 consolidation locomotives of the Baldwin Locomotive Works of Philadelphia.

Bridge Notes.

The contract for the superstructure for a highway bridge over the Mississippi at St. Paul has been let to the Key-

stone Bridge Co. for \$340,000. The length between abutments is 2,770 ft. The contractor for the substructure is A. McMullin. This portion of the work is about half done. Some description of the bridge will be found in another column.

Manufacturing and Business.

The Isbell Machinery Co. is to manufacture and sell engines, motors, pumps, meters, hydraulic rams, railroad switches, machinery, machinists' supplies, tools, etc. Capital stock, \$100,000. To operate in Eastchester and New York City. Trustees: Robert H. Isbell, George F. Betts, S. S. Clark, Matthew E. Logan and Walter S. Logan.

The Scarritt Furniture Co. have lately furnished chairs for three chair cars running between San Antonio and Aransas Pass. These chairs are of large size and are upholstered in rich bronze plush. The cars are said to be very comfortable and handsome.

The Kingsford Foundry & Machine Works, Oswego, N. Y., have completed the extension of their boiler works, making it the largest and most complete boiler works in the state. They have an area of 300 by 65 ft., and are fitted up with new and improved machinery. They are now engaged in completing an order of 150 boilers for the Advance Machine Co., of Kalamazoo, Mich. The works are under the management of Mr. J. J. Tonkin, M. E., who has also the management of the exterior works of the Kingsford Starch Co. He has lately designed a new horizontal stationary engine that is meeting with popular favor and which presents many new and novel features.

The M. C. Bullock Manufacturing Co., of Chicago, report the following shipments: To the Looffholz Exploring & Mining Co., Norway, Mich., one Little Champion diamond drill, with complete prospecting outfit; to Moore & Agnew, Hurley, Wis., one 6 x 8 portable hoisting machine; to the Hydraulic Cement Co., Utica, Ill., one boiler and pump for the city water-works; to the Stearns Lime Co., Chicago, one 5 in. Eclipse rock drill outfit; to the Spring Valley Coal Co., Spring Valley, Ill., two 8-ft. Lane's patent band friction hoisting drums, connected and driven direct by a pair of 18 x 30 link-motion reversible engines, also two 8-ft. wrought iron sheaves; to the city of Spring Valley, Ill., one boiler and pump for the city water-works.

The Dunham freight car door has been adopted for 1,500 new box cars contracted for, last Saturday, in Chicago, by the Chicago, Burlington & Northern; also, for 500 cars now being built for the Wisconsin Central. The Minnesota & Northwestern have also selected this door as their standard.

The Chase Combination Car Spring Manufacturing Co. has been organized, with a capital of \$500,000, to manufacture a combined elliptic and coil spring of novel design. Joel Farist, the President, is also President of the Farist Steel Co., of Bridgeport; Otis W. Randall, Vice-President and Treasurer; E. R. Wheelock, Secretary and General Manager, with offices at No. 72 Broadway, New York.

The New York Iron Roofing & Corrugating Co. report an unusual demand for their specialties, considering the season of the year, and are now filling two orders for 60,000 ft. of roofing for immediate use.

The New White River Bridge on the Central Vermont.

The new bridge across White River, the scene of the Hartford accident on the Central Vermont road last February, was tested on the 15th inst. First 12 locomotives, extending the entire length of the bridge, a combined weight of 840 tons, were run upon it and stopped, causing no appreciable depression. Next, three of the heavier Moguls, weighing about 240 tons, were joined and run across at different rates of speed, the quickest crossing being made in 12 seconds and the highest speed attained 40 miles an hour. The average deflection on the 150 ft. spans was $\frac{1}{16}$ of an inch, and on the 50 ft. spans, $\frac{1}{32}$ of an inch.

The bridge is of iron, riveted lattice with a guard rail of new pattern, and was built by the Vermont Construction Co., of St. Albans, and cost about \$40,000. The test, which was very satisfactory, was conducted by Messrs. George A. Ayer, Manager, and S. W. Bowles, Jr., Engineer, for the Construction Co., and A. C. Bean, Roadmaster, and C. H. Clark, Superintendent of Bridges, for the road; and was witnessed by ex-Gov. Samuel E. Pingree, Chairman, and Alfred E. Watson, Clerk, of the Board of Railroad Commissioners.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Spanish Consul-General in New York invites bids for the construction and operation of a system of railroads in the island of Porto Rico. The total length of the system is about 399 miles, divided into five principal lines, which vary in length from 30 to 115 miles, and we understand that the concession will be made only for the whole system. The Spanish government guarantees eight per cent. per annum on the actual capital expended, and will make an operating concession for 99 years. At the end of that time the whole property is to revert to the government, which also retains the right to take possession at any time prior to the expiration of the concession on a valuation to be made according to certain stipulations in the original contract. The maximum capitalization on which the interest will be guaranteed is 9,029,000 pesos, say \$9,234,000, or an average of about \$28,000 per mile. The authorized capitalization per mile varies, however, on the different sections, from \$22,400 to \$32,000. The maximum length of each section is prescribed, and the concessionary will receive no guarantee on capital expended on the track and roadway beyond this limit. On the other hand, he will be credited only with the length actually built if it falls below the maximum stipulated length. The line is to be one-metre gauge, with steel rails not less than 40 lbs. per yard. The maximum grades are fixed at from 1.5 to 2.5 per cent., and the shortest radii of curves at from 330 ft. to 500 ft. on the various sections. The specifications prescribe the character and location (within limits) of stations, the character of the bridges, etc., the character of highway crossings, which are all to be provided with gates, if at grade, the formation width of banks and cuts, the size and number of ties, and many other matters. All material is to be passed on by government officers. This is true also of the rolling stock and permanent structures. The concessionary is to construct a telegraph line, and to permit stringing government wires on the poles. He is to carry mails free. The classification and rates for freight and passengers are to be prescribed by the government according to schedules now existing, and the rates are to be subject to revision according to certain prescribed conditions. The concessionary will not be permitted to make a traffic contract with any other transportation company. Such is an outline of the specifications and conditions, which may be seen in full at the office of the Spanish Consul-General in this city. The work is to be completed in six years, and the contract will be awarded in San Juan de Porto Rico March 5 next.

The conditions are probably too onerous to tempt American capitalists, few of whom would be willing to make investments so entirely at the mercy of their own government and its functionaries, even for a guaranteed eight per cent. Our manufacturers, however

would be ready and willing to supply the rails and rolling stock to the plucky foreigner who gets the concession.

The last meeting of the New England Railroad Club was devoted to frogs and switches. From the report which we have received, it appears that no one raised his voice against the proposition of the principal speakers of the evening that the modern split switch is a safety switch, and the only one that can be properly called so. Yet, New England is a region of long winters and heavy snows, and it is there that the special shortcomings of the split switch should be most observed. Probably the reason of the silence of those who still use stub switches was the knowledge that they have not a scientific leg to stand on, and that their "practical" leg is very feeble. But because they keep still it does not follow that they are few in number. On the contrary, the use of stub switches is still amazingly common. Within a year we have seen split switches put for the first time in the track of one of our great lines on a section where 16 passenger trains each way are run daily, and some of them heavy and fast. For years these trains have run over stub switches. Observation, and the accounts of accidents, reveal the continued use of stub switches on many of the roads still ranked amongst the best in other particulars. The split switch requires more attentive care in winter than the stub switch, but it can hardly be doubted that the extra cost of trackmen's labor is more than made up in economy of maintenance of track and rolling stock, and in the greater immunity from accidents. On some of the best roads which use split switches trackmen are kept out night and day in snowstorms clearing the points, and on the elevated roads of New York men are out with brooms whenever snow is falling.

The New York Central, which now heats a large number of its suburban trains by the Martin system, obviates the objections made concerning the inconvenience and discomfort of picking up coil cars at way-stations, by placing its spare cars one or two stations further from the city than formerly. This is indeed a simple method, and was pointed out in the *Railroad Gazette* a year ago. A steam boiler should not be put in at a small way-station for the sole purpose of warming cars, until it has been found out how cheaply a car can be hauled five or ten miles further, and thus warmed by the locomotive.

It may be assumed that a stationary boiler can be run for \$5 a day of 12 hours, and that an extra car can be hauled at an expense of 7 cents per car mile. The relative expense of putting down a boiler at a small station solely for the purpose of heating up cars and running cars an extra distance to a large station where steam plant is already in existence compares as follows:

EXPENSE PER DIEM.
Running stationary boiler \$5.00
Running extra car 10 miles on 4 trains each way per day at 7 cents per car mile 5.00
Excess ..... .60

It would therefore appear that it would be cheaper to put down a stationary boiler where the extra car mileage would be more than 70 miles daily.

Of course, circumstances would largely affect these figures. In some instances the boiler could be used to heat the station buildings, displacing stoves, and in many places the boiler could also be used to pump water for the locomotives. In other cases the train service is so arranged that unless the car is detached at a certain point, an extra car would be required, the cost of which, with the interest, would offset the cost of the boiler.

The convenience of heating a train of cold cars from a stationary boiler instead of lighting up the stoves in the cars is obvious. Cleaning the stoves, laying and lighting the fires, and getting up a circulation involves considerably more time and labor than coupling up the heating hose and connecting one end of the train with the stationary boiler. The latter operation would probably take under 20 minutes, even with a long train, and in many cases this economy of time and labor appears to be appreciated. The Boston & Albany, for instance, has fitted up an old freight engine with special couplings for the purpose of heating cars (on four tracks at a time) in the yard at Springfield.

In another column will be found a letter from a Pittsburgh correspondent concerning the Baltimore & Ohio collision, which we referred to a few weeks ago. The circumstances detailed by this correspondent certainly indicate great carelessness. This is first seen in the absence of a record showing what trains had passed. Relying on the memory of the operator

for this is certainly reprehensible, even if there had been no change of the person on duty. In addition to this it would seem to be a very ordinary as well as essential precaution that on a change of operators information as to the state of things should be given. The acceptance by the operator of the conductor's insufficient reply shows a degree of recklessness usually attributed to a lack of experience, or a gross disregard of the important character of his business. It is clear that much of the trouble here could only have been prevented by that careful supervision of this branch of the service by competent officers, which we have uniformly insisted on as absolutely essential. No system can be devised that will guard effectually against carelessness and incompetency. The suggestion as to anticipating a necessity for orders cannot be too often repeated. Such looking ahead would eliminate many of the cases in which it is found "not practicable" to give the order first to the superior train. In fact, a dispatcher who is not thoroughly trained in this important particular cannot reasonably be regarded as well equipped for his work.

The plan of giving an advance order to the superior train, which our correspondent advocates, doubtless would sometimes be useful, as in the circumstances he describes. But it could not always be adopted, and its use might offer a temptation to lapse into the old way of thus holding a train while issuing orders for the movement of inferior trains short of the point given, without duplicating them to the superior train. This appears to be the chief risk in this practice. In the attempt to avoid one danger a greater one may arise. The committee on uniform rules probably had something of this in mind in formulating the rule on the "Hold" order. In the case in question such a preliminary order might have led to more minute inquiry as to which train was 2d 87, but under the evident conditions of carelessness the true 2d 87 might readily have been allowed to pass as the 1st, with the information that there were no orders for it. This case forcibly brings up the question of the better identification of trains, either by some distinctive mark or by the use of the engine number in connection with the train number in designating trains in orders.

Superintendents cannot spend time more profitably than in making sure that their conductors and engineers habitually consult each other concerning road rights. Every month we record collisions which clearly must have resulted from the neglect of two men. This time it is a serious case, as will be seen from the monthly record in another column. Where two men contribute to the same mistake so often there must be something wrong in the system—or lack of system. It cannot be laid wholly to coincidence. When we read that the engineer's watch was slow, it follows almost of necessity that the conductor did not care whether his watch was slow or not. A conductor who must consult his engineman a dozen times during a trip naturally tends to attach many times more importance to the errand that leads him to the engine than if he (ostensibly) performed the same duty sitting in his caboose, and in any manner he please. Having two men give attention to the same precaution does not merely double the safety, it substitutes regular habit for mere treacherous memory. An engineman who regularly and frequently consults with the conductor thereby takes a valuable means of getting used to moving cautiously, and learns to arrest himself if the conductor is derelict. Or, if he does not make good use of his training in this line, an occasional decoy movement will bring him to his senses. Let him be ordered forward when it is his duty to refuse obedience. The best way to sharpen one's wits is to use them.

The freight train above alluded to started from a "yard" which was some distance from the telegraph office where train orders usually come; and we heard recently of another case where the uncertainty as to what is, and what is not, a station, caused trouble. A train which left a "station" all right stopped before it got out of "the yard," and allowed another train of the same grade to pass it; the dispatcher was left ignorant of the change, and the operator at the next station mistook the identity of the trains. It will be remembered that the Fitchburg collision of a month ago resulted from loose ideas about yard limits. All stopping places should not only have definite bounds; they should have distinctive names as well. To say Smithville-west-end-of-the-yard, or Jonestown-upper-switch is clumsy. Why not have separate names, conveniently short? And to "string out" a yard along a mile or two of main track, making a long stretch on which passenger runners must always be specially nervous, is undesirable in other ways. Storage and switching tracks should be connected with main tracks

at as few points as possible. Spur tracks on which trains can "pull up" in switching, thereby avoiding the use of the main track, can often be put in it at very moderate cost, and they are a valuable aid to safe working. Possibly that fatal Meadville train would not have got out of the yard so easily if it had been the custom there to never use the main track on the time of a passenger train (even in yards) without a dispatcher's order.

The Cincinnati, Hamilton & Dayton has issued to its passenger conductors an order requiring them to record the collection of each cash fare at the time of collection and to note on the record the number of the car in which the collection is made. This road, we believe, does not have the well-known duplex cash fare ticket, in using which, the conductor, by the aid of his punch alone, makes a complete record of the transaction and at the same time a receipt for the passenger. The addition of the car number to the record is one additional check against errors, and the blanks are arranged so that the time occupied in recording a collection is no longer than before; but it would not be easy to arrange for recording this additional fact with a punch.

The whole subject of cash fare collection is one that causes superintendents considerable bother, if not anxiety. The most perfect checks are necessary, simply as a matter of accuracy—to guard against mistakes. In addition to this, most officers deem it necessary to guard against dishonesty. Few superintendents will claim never to have made a mistake in their constant aim to appoint only honest men. In addition to this, there are frequently conductors for whom the superintendent does not deem himself wholly responsible, though they be "shaky;" appointees of previous superintendents, and yet whom he doesn't think best to get rid of. Even station agents, whose financial dealings are all subject to checks and safeguards, occasionally turn out black sheep. The root of much difficulty is in the frequency of occasions when the conductor is short of time. The best of checks are of little value when a conductor has to collect fifty fares from tipsy or even hilarious passengers in a ten mile midnight trip, or from two old women between flag stations two minutes apart. Unless the conductor is rigidly required to adhere to the rules even at a loss to the company, he will naturally deem it better to take fares without recording them, than to let them go uncollected. Then if he is approved, tacitly or otherwise, the entering wedge of the temptation to steal has been driven. Careful provision of checks and enlightened search for honest men to fill the places seems to be the least that can consistently be done.

The running of trains too close to each other, which is common on a great many roads, and the evils of which appear in our record of rear collisions of freight trains nearly or quite every month, is a kind of looseness which needs more looking after than it generally receives. It is so often necessary to relax strict rules concerning this point, and there are so many occasions when it is perfectly safe for one train to follow another within less than five minutes that superintendents are inclined to regard this as one of the points on which they must trust to their men's judgment. And, indeed, a space of five minutes is, in cases where trains are heavy and slow, a short interval and one which needs to be defined and respected very carefully if it is to be maintained. A train running at fifteen miles an hour goes only $\frac{1}{4}$ miles in 5 minutes; enginemen following as closely as this become familiar with the sight of cabooses ahead, and unconsciously get to look upon it with more contempt than would be the case if eight or ten minute intervals were required. But as trains are run, those of different weights running at speeds varying 50, 75 or 100 per cent., and the practice of hurrying over easy portions to save coal on ascending grades being allowed, it is very easy to let the prescribed time interval be dangerously reduced. Even where station indicators are employed, and it is understood that enginemen can certainly read at every station the hour and minute that the preceding train started from that point, safety is by no means assured. Station men will, without close surveillance, fall into the habit of setting the indicators some minutes after a train has passed, instead of attending to the duty immediately on its departure. Enginemen will frequently find the view of indicators obscured by passing trains, and so will feel less compunction in neglecting to look at them at other places.

Where there are no block signal arrangements of any kind and no time indicators, the question of the length of interval deserves attention. There are undoubtedly many places where it should be more than five min-

utes. A man walking back four miles an hour, which is a brisk pace, and a freight train moving 15 miles an hour will meet at a point less than 1,400 ft. from the point at which the man started. While it is true that trains can often be stopped in this distance, it is also a fact that many long ones, composed of heavy cars, need twice as much space when grades or slipperiness or sleepiness operate unfavorably; so that it is plain that energetic action on the part of flagmen in starting back before their trains are fully stopped and the alertness of runners in seeing flags a long distance before they reach them, are really important factors on which we are constantly depending for safety. Fourteen hundred feet is but little more than the distance taken to stop an air-braked passenger train in a recent trial, and when the brakeman delays a few seconds before starting with his flag, the favorable effect of the conditions just mentioned is very rapidly neutralized.

Inspection of runners' habits and of the faithfulness of those who are set to warn runners if they follow too closely should not be neglected because it is difficult and unpleasant. Where block signals are entirely out of the question, time indicators should be freely employed. It is a pretty poor road that can not afford to have these safeguards on at least some part of its line. Automatic time indicators are being tried to a limited extent, and some of them have given a good degree of satisfaction.

Powers of Railroad Commissioners.

The New York Board of Railroad Commissioners in their annual report for 1887 recommend several important changes in the railroad laws of the state. Most of these suggestions are by no means new; but in the present temper of the public mind they are more likely to be heeded than they were in past years.

The first of these proposals relates to the power of the commission itself. Like the Massachusetts Commission that of New York had technically no authority and was compelled to rely on moral suasion for enforcing its decisions. This moral force has now been reduced to a minimum by a decision of the Court of Appeals in the question of a new station at Hamburgh on the Erie Railroad. The commission had decided that such a station was a public necessity, and the lower courts had ordered the railroad to comply with the recommendation; but the Court of Appeals, while admitting the facts with regard to public necessity, nevertheless reversed the decision of the lower courts because the findings of the commission had no legal authority. This being the case, the Commissioners ask that the necessary minimum of such authority be granted them; and that their decisions, subject, of course, to appeal and to review, be made a basis for orders on the part of the courts.

Though we strongly believe that the main purpose of a commission is to secure publicity rather than to enforce specific changes—to make reports rather than orders—we do not see how this modification of the law can well be resisted. In other states which began with a law like that of New York, the tendency has been in the direction of greater stringency. Both Massachusetts and Iowa, where the system of regulation by public opinion has been most thoroughly developed, now have much stricter laws than those of New York. It would, perhaps, have been better could we have waited a year or two longer before making the change; but the action of the Erie railroad has made it impossible. Government by public opinion is a success only as long as people acquiesce in the recommendations of the authorities who are supposed to represent it. As long as everyone does so there is no necessity for compulsion. But when the findings of such a body have once been openly disregarded on grounds of legal technicality, this state of things can continue no longer. Such defiance is a challenge to public opinion to show what force there is behind it. The authority of the commission cannot, after being once questioned, remain the same as before. It must be either much weaker or much stronger. If such a challenge goes unanswered, the authority of the commission is destroyed. The only alternative is to meet the challenge by strengthening the commission. We are sorry that the issue was raised, but now that it has been raised we do not oppose the grant of additional powers to the commission, which we believe to be almost inevitable.

A second series of proposals relates to the provisions regulating the lease of one railroad line to another. At present the directors have almost uncontrolled authority in this matter. No ratification is required from the stockholders of either line. The chance for abuse of this power is too obvious to need comment. If the directors of the main line buy up most of the

stock of a branch, they can make a lease of that branch which will be highly lucrative to themselves at the expense of the stockholders of the main line. The matter is regulated only by a statute of the year 1839, which is quite inadequate to meet the requirements of the present day. The Consolidation act of 1869 provided safeguards against the disregard of stockholders' interests in cases of actual union; but it was seen that its operation could be evaded and the abuses continued by an ill-regulated system of leases.

The commission is right in urging that the ratification provisions of the Consolidation act be extended to the Leasing act, so that railroad leases cannot be made without the actual approval and consent of the parties interested. But we do not think that they are wise in wishing to extend all the other provisions of the Consolidation act, and forbidding the lease of one parallel line to another.

In the first place, it is doubtful whether such a law could be fully carried into effect. It often happens that not merely good railroad economy but good public economy requires that competing lines be managed harmoniously. It is difficult to secure such harmony except by consolidation or lease; especially since the Inter-state Commerce law has made pooling contracts more precarious than ever. If the law prohibits railroads from attaining such unity of management when the public interests demands it, it is sure to be evaded; and one such case of evasion for good purposes opens the way to a dozen cases of evasion for bad purposes. The existence of this provision with regard to parallel lines in the Consolidation act was one of the chief causes which led to the abuse of the leasing system, which formed a steady means of evading it. It is true that the legitimate reasons for desiring to evade the law would be much less if the recommendations of the commission concerning limitation of railroad construction were adopted; but of this we imagine that there is very little chance for the present.

But whatever doubt there may be as to the proper relations of parallel lines to one another, there is no doubt whatever as to the proper relations of directors to the property intrusted to their charge. It is, therefore, practically unwise to mix a clear question with an obscure one. A law to prevent A from virtually converting the property of B and C to his own uses is a very different thing from one restricting the right of B and C to contract with one another, concerning their own property. The two things are quite distinct and should be kept separate. If we attempt to make the same law cover both points it will be no stronger than the weakest part. The doubtful section will endanger the whole. It may not hinder its passage in the Legislature, but it will decidedly interfere with its operation when it becomes law. It is a most serious practical mistake to confuse clear questions of public morals, such as are involved in the relation of trustees to the property in their charge, with disputed problems of political economy involved in the attempt to regulate the mutual relation of parallel lines. If the moral sense of the community were no better than its knowledge of railroad economy we should be badly off. Its judgment on morals is generally not far from right; its judgments on railroad management are apt to be wrong. In the interest of morals quite as much as of railroads it is important to keep the two things separate.

December Accidents.

Our record of train accidents in December, given in this number, includes 92 collisions, 83 derailments and 7 other accidents; a total of 182 accidents, in which 71 persons were killed and 211 injured.

These accidents are classified as follows:

COLLISIONS:	
Rear.....	51
Butting.....	36
Crossing.....	5
	— 92
DERRAILMENTS:	
Broken rail.....	9
Loose or spread rail.....	3
Broken frog.....	1
Broken bridge.....	2
Defective switch.....	3
Broken wheel.....	1
Broken axle.....	4
Broken truck.....	1
Misplaced switch.....	12
Bad switching.....	4
Cattle on track.....	1
Landslide.....	2
Purposely misplaced switch.....	2
Malicious obstruction.....	2
Ice on track.....	1
Man on track.....	1
Unexplained.....	33
	— 83
OTHER ACCIDENTS:	
Cars burned while running.....	1
Bolt explosion.....	2
Broken parallel rod.....	1
Broken truck.....	1
Broken axle.....	1
Broken draw-bar.....	1
Total number of accidents.....	182

The causes of collisions where given were as follows:

	Rear.	Butting.	Crossing.	Total.
Trains breaking in two.....	5	1	..	5
Misplaced switch.....	4	1	..	5
Failure to give or observe signal.....	3	..	..	3
Mistake in giving or understanding orders.....	..	3	1	3
Miscellaneous.....	12	6	1	19
Unexplained.....	27	26	4	57
Total.....	51	36	5	92

A general classification shows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Defects of road.....	19	..	..	19	10
Defects of equipment.....	6	6	..	17	9
Negligence in operating.....	30	16	1	47	26
Unforeseen obstructions.....	..	9	..	9	5
Unexplained.....	57	33	..	90	50
Total.....	92	83	7	182	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Passenger.....	46	29	4	79	20
Freight and other.....	132	56	3	191	71
Total.....	178	85	7	270	100

The casualties may be divided as follows:

	KILLED.	COLLISIONS.	DERAILMENTS.	OTHER.	TOTAL.	P. C.
Employees.....	12	12	3	..	57	80
Passengers.....	5	3	..	..	8	11
Others.....	4	2	..	..	6	9
Total.....	51	17	3	..	71	100

Thirty-eight accidents caused the death of one or more persons, and 38 caused injury but not death, leaving 106 (58 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with December, 1886, shows:

	1887.	1886.
Rear collisions.....	51	46
Butting	36	16
Crossing	5	3
Derailments.....	83	46
Other accidents.....	7	4
Total	182	115
Employés killed.....	57	31
Others	14	4
Employés injured.....	87	78
Others	124	51
Pass. trains involved.....	70	53

Average per day:

	Accidents.....	5.87	3.71
Killed.....	2.29	1.13	
Injured.....	6.80	4.16	

Average per accident:

	Killed.....	0.390	0.304
Injured.....	1.159	1.122	

Rear collisions maintain the disagreeably high figure they attained the previous month, and the number of butting collisions is almost double that in November. The total number of accidents is the largest since February, 1885; the number of persons killed in that month, however, was less than two-thirds of the number now before us, and the average number killed per accident was only .204, as compared with .390 now. The number killed in the month now recorded is 50 per cent. ahead of November and double the December figures a year ago, bringing the total for the year 1887 up to an alarming height.

We noted a month ago the fact that rear collisions are almost always the result of negligence in signaling. One of the cases this month illustrates a cause which is doubtless very common, the running of freight trains too close to each other, so that even with flagmen who have consciences collisions are inevitable. In another case "the train boy [who was sent with a flag] could not get back far enough." One collision which at first thought would seem to belong among those caused by breaking in two had to be classed elsewhere, the trouble occurring after the engineman had been to a station and set off a part of his train. Doubtless the superintendent attributed it to innate depravity. Among the curious reports of the month is the account of a train which got away from its custodians and ran 48 miles before it encountered an obstruction; but the Burlington & Missouri River is still ahead in the record of "right smart" runaways.

The butting collision at Meadville, Pa., is one of the most serious accidents of the month, happening as it did on the main line of an important road, and through the gross negligence of three men, who should have been cool headed and careful, instead of dull or reckless. The runner of the second freight engine appears to have assumed that the forward runner would look after the safety of the train, though after the train had started the fireman climbed forward over the tender to inquire if the passenger had arrived and cleared. He received an answer which he accepted as satisfactory, though it seems to have partaken more of the character of an ill-natured ruffian than of a sober statement. It requires patience, good sense and considerable tact to do so simple a thing as to ask a question when dealing with a person who is inclined to treat the subject carelessly or with ridicule. The conductor of the train and the runner of the leading engine must have been guilty of a degree of negligence that would convict them of manslaughter; at least no palliating circumstances appear, and there would seem to be none possible.

Although the month had no startling horror like those of the early part of the year, its record is fully in keeping with the year, and we have had occasion to speak of several of its accidents in previous issues. The first three months of 1887 remain in the memory of many persons who never before gave much thought to railroad accidents, because each one of them had a blood-curdling horror; but in the closing month of the year there were more accidents than in any one

of them; the killed were 71, as compared with 59 in the worst of the former three, and the number of accidents to passenger trains was nearly 50 per cent. above the monthly average then.

The Baltimore & Ohio Annual Report.

The sixty-first annual report of the Baltimore & Ohio Railroad is a hard document to understand. It is a survival from the old system of reports, where the object was to tell as little as possible about the condition of the property. There are many roads which publish reports that are more misleading, but few which publish anything so totally blind. It is not a case where the directors try to persuade the public to draw wrong inferences, but one where they render it hard for the reader to draw any inferences at all.

We have this year two documents instead of one; the report itself, which is arranged in the old style, and the advance statement of President Spencer, which is in many respects better, but not wholly satisfactory. Neither of them contains anything which can fairly be called a capital account. The report has a general balance sheet, so confused as to be worth very little; a so-called statement of profit and loss, which is really a very crude treasurer's time balance, and nothing more; and a statement of results of operations, which fails to connect with either of the other accounts. President Spencer gives us a schedule of indebtedness, which is well digested, but not incorporated into a balance; and a return of the year's operations, very much clearer than anything contained in the report, but balanced by an item of \$17,605.44, which appears nowhere else in either of the reports, and is therefore beyond the reach of any test or criticism.

In the general balance sheet of the company, stock, surplus, and floating debt are correctly stated. The account of the bond issues is complicated. Some of the loans are entered in full among the liabilities, and any sinking funds which there may be are put on the other side as assets. Other loans are not entered in full, but the sinking funds are deducted, so that only the difference appears, while still others are offset by securities held by trustees, and are not counted at all. There is a similar confusion in the assets. The road and the equipment of the main stem are properly entered; and the remainder is a mixture of sinking funds, stocks of other corporations, and miscellaneous expenditures. On neither side can the total be said to represent anything definite. The \$115,000,000 of nominal liabilities and assets might for all practical purposes just as well be \$130,000,000, or \$150,000,000, or any sum which would suit the convenience of the treasurer.

With the aid of Mr. Spencer's statement, we may rearrange this balance sheet as follows:

	Liabilities.
Stock.....	\$14,784,600
Scrip	7,986
Preferred stock.....	5,000,000
Funded debt, main line	\$30,520,000
" branches.....	50,637,640
Floating d-bt.....	8,769,314
Current debt	2,378,693
Surplus.....	\$112,118,213
	48,083,720
	\$160,201,933
	Assets.
Road and equipment, main line	\$82,871,918
Sinking funds	11,555,152
Uncollected bills, etc.....	1,028,983
Supplies.....	1,740,773
Cash.....	360,716
Balance, expenditure of B. & O. on branch lines for improvements, stocks and property rights	\$77,557,542
	82,614,391
	\$160,201,933

This last figure of cost of branch line rights is a trifle startling. It should not be understood that the B. & O. has actually handled all the cash to pay for it; but they have in any event assumed obligations to a corresponding sum, which practically amounts to the same thing. This sum of 81½ millions is enough to wipe out all their surplus and 33½ millions besides—that is, if it was spent unprofitably. The financial results of this investment remain to be noted.

To do this we must study the profit and loss accounts for the year. Unfortunately we cannot combine for this purpose the report itself and Mr. Spencer's figures; for the two disagree. The report makes out a payment of two dividends and a surplus for the year of \$32,000; Mr. Spencer only pays one dividend, and leaves a surplus of but \$17,000. Part of this difference is to be accounted for by the fact that the treasurer includes in his report certain items which were palpably not income. But one thing is clear from both reports, and that is the utterly unprofitable character of the branch line traffic. The details of operation for the different lines are given in another column; we only give the general result at this point:

Excess of earnings of all branch lines above operating expenses.....	\$2,270,431
Rentals of branch lines	707,572
Net payments on Washington Branch.....	62,200
Branch line interest account.....	2,604,728
Total branch line expenses.....	3,374,500
Net deficit on branches.....	1,104,068

This should, for absolute correctness, be increased by the branch lines taxes and reduced by the interest on sinking funds accumulated against branch line debt, as well as by a fraction of the cash income from stocks, etc., during the year. But the net result of all these changes would be very slight. On branch line operations there is a deficit of over a million dollars.

We are now in a position to look at the income account of

the main stem and to put it into something like proper shape.

Income.	
Net earnings.....	\$4,343,344
Cash income from stocks, etc.....	298,916
	\$4,642,260
Expenses.	
Rentals of sections of main line.....	157,479
Net excess ground rents.....	20,325
Taxes.....	257,215
Deficit on branches.....	1,104,069
Interest on main line debt.....	1,69,940
	3,170,028

Leaving a net income of..... \$3,170,028

The interest on the company's securities in its sinking fund would fairly swell this amount to over \$1,800,000. But it has been necessary hitherto to apply this interest, besides the additional payments, to swell the amount of the sinking fund. The total sinking fund appropriations, including this interest and one annual purchase fund of the same nature, amounted to \$740,000. Preferred stock dividends consumed \$300,000 more. In the aggregate there was not quite \$800,000 available for dividends and for interest on floating debt. The latter item, in Mr. Spencer's account, is made very small indeed, only \$176,000 on a principal of \$8,769,000. The explanation probably is that most of this became due during the latter part of the year. At any rate, according to Mr. Spencer's statement, a trifle over \$600,000 was left from income account, which enabled the company to pay a 4 per cent. dividend. Some readjustments will probably have to be made in order to bring the general balance sheet into conformity with this state of things; for the treasurer's balance shows two dividends to have been paid during the year, which would have a deficit of over half a million.

The state of things seems to be this: The company this year, with heavy traffic, was able to divide about \$600,000, 4 per cent. Next year, whatever funding plan be adopted, it will find its interest account increased \$300,000 or more. By abandoning part of its system of sinking fund payments, it could make up for this loss; by abandoning the whole system and realizing on the interest of what it now has, it could probably divide 6 or 7 per cent. instead of 4. But on the other hand, the proportion of stock to bonds is so small that an unfavorable year might wipe the whole away, and leave the road no more than able to meet its fixed charges. Our analyses of the general balance sheet shows in what a bad shape the branch line property is, and how little the nominal surplus probably amounts to in actual practice. It may represent past earnings; it does not seem to represent future earning power.

A remarkable judicial ruling comes from Iowa.* A woman brought an action for damages for injuries received while alighting from a moving train. It appeared that when the train arrived at the station where she intended to get off it did not stop long enough to enable her to step from the platform of the car. Her two young children who were traveling with her had preceded her and alighted safely before the train started, and it was the desire not to lose them which impelled her to jump after the train had commenced to move. There is a statute in force in Iowa which provides as follows: If any person not employed thereon, or not an officer of the law in the discharge of his duty, without the consent of the person having the same in charge, shall get upon or off any locomotive engine or car of any railroad company while said engine or car is in motion, he shall be guilty of a misdemeanor, and be punished by fine not exceeding \$100, or be imprisoned not exceeding thirty days.

The Supreme Court decides that before the woman can recover she must prove one at least of the three exceptions in the statute, viz.: Either that she was a person employed on the train or that she was an officer of the law, or that she got off the train while in motion with the consent of the conductor or some other officer of the company in charge of the train. If she cannot show any of these things she cannot recover, for the reason that otherwise her act of jumping from the train while in motion was unlawful, and if unlawful it was negligent. This is a case of strict construction—of sticking in the bark of a statute with a vengeance. Under this ruling, if a passenger on a train in Iowa should see that a drawbridge ahead of the train was open or that another train was approaching on the same track, and rushing to the door should jump off and save his life before the train went into the river or the collision occurred, he would be at once guilty of a crime, and would be liable to a fine of \$100 or imprisonment for the space of 30 days, because he did not, before he jumped, hale up the conductor and ask his permission to leave the car while in motion. History tells us of a Venetian statute, which to discourage street encounters in the time when men wore side arms, made it a capital offence to shed blood in the streets of Venice. It also tells of a physician, who, meeting a man in a fit on the streets, lanced him and saved his life. A sensible magistrate decided that the act of the physician did not come within the intent of the statute, and that he was not subject to the extreme penalty for his humane act. The Iowa Supreme Court would no doubt have hanged the surgeon and reversed the decision of the magistrate. The truth is, as any one can see at a glance, that the Iowa statute was intended simply to punish trespassers for getting on trains while in motion to steal a ride, and the same persons, or others intending to evade the payment of fare, from jumping off to escape detection by the conductor. To extend it to the case of necessity such as we have alluded to, is manifestly absurd, and surely the case of a mother separated from her infant children by the neglect of those in charge of the train, and almost crazed at the thought of losing them, is one of natural impulse and fear of danger, which may properly be deemed necessity.

* Raben v. Central Iowa Ry. Co., 34 N. W. Rep., 621.

The durability of rubber hose is a very important point in the cost of steam heating, and it is moreover obvious that if the hose fail frequently and unexpectedly a great deal of inconvenience will result in running long journey trains in cold weather. Continuous heating has been so little used until this winter, that little experience is available on this point. Two New York local roads have, however, used continuous steam heating for some considerable time, and their experience is valuable. Experience on the Staten Island Rapid Transit Railroad shows that rubber hose used for continuous heating lasts only about three months, the steam being taken from the boiler at about 40 lbs. pressure. On the Manhattan, the experience appears to be more favorable, and rubber hose is preferred to any flexible metallic connections which have been tried on that road.

So far this season only three pieces of hose have had to be renewed on the Third avenue line, and these renewals were not rendered necessary from the action of the steam but from extraneous causes. The cars on the Third avenue line are equipped throughout with the improved Gold coupler, the Hickman coupler being used on the Second, Sixth and Ninth avenue lines. The Hickman coupler is practically a common union with lugs or handles on the nut. The lugs are generally struck with a hammer when it is desired to tighten or slacken the coupler. In spite of this forcible method of making a steam tight coupling, leakages are not infrequent. The Gold system of heating is in use on all cars both on the Manhattan and Staten Island, but it is only fair to explain that the leaky couplings on some of the Manhattan trains are not due to the use of the Gold coupler.

The recent meetings to settle the lines of the future standard Janney type coupler seem to have awakened the latent energies of that numerous class, the inventors of car couplers. The last week's issue of the *Patent Office Gazette* contains no less than eleven patents relating to car couplers. Most of the devices shown are hopelessly impracticable, and some could not use the ordinary link, and require some special connection fitted with a combination lock and a silver plated coffin handle. Others are apparently better suited to serve as type writers, or barrel organs, or sewing machines than as car-couplers.

The inventive genius of this country must, however, have vent in some direction. A veteran master mechanic suggests that car coupler inventors should turn their attention to an automatic locomotive engineer, who would never look on the cup when it is red, never lose time, never have leaky flues or a hot box, and never misread orders, have a collision or stick in a snow-bank. He says he feels sure such an invention would attract the attention of our great railroad monopolists and fulfill a long-felt want, especially if it could be warranted to run 200 miles after a nickel had been inserted in the slot.

The storm which first made itself felt in Dakota, Wednesday, the 11th, and extended from the most northerly point of telegraphic communication to the gulf, was in its extent, severity and duration one of the most remarkable known. The people of the Northwest say that it was the worst since 1873. Certainly, the loss of life and property and the suffering caused have been most serious. The lowest temperature reported was something like -60 deg. This, however, is not official. The intense cold was aggravated by furious gales, and much snow fell. It is now reported that in the Northwest 150 people perished. That estimate we judge to be below the truth. The interruption to railroad traffic was serious. Trains were blocked for greater or less time in five Northwestern states. On certain lines through trains were stopped for five days, and even the "Short Line" trains between St. Paul and Minneapolis were blocked at times. At least one express train is said to have been four days between Chicago and St. Paul. One road is said to be still blocked. We hear of no serious suffering among passengers. There have been several train loads of live stock frozen, and it seems impossible that there should not have been considerable loss of stock on the ranges. Concerning this the accounts are conflicting. From the Indian territory the report is that the loss is very great, while Helena dispatches say that the stock is suffering little. The effect on Chicago traffic was seen in diminished receipts last week, and the effect on the January earnings and expenses of the Northwestern roads will naturally be serious.

The steamers "City of New York" and "City of Paris," which are now being built for the Inman Line, will be 525 ft. long on the water line, or 560 ft. over all; 63 1/4 ft. beam, and 42 ft. molded depth.

The gross registered tonnage will be about 10,000 tons, or about 2,000 tons greater than that of the largest existing transatlantic steamers, principally owing to the greater beam, which is the only dimension in which a considerable increase is possible. The draft is limited by the depth of water on the bar at the entrance to the harbor of New York, and an increase of length without a corresponding increase of depth simply makes the vessel a shallow girder liable to be severely strained in a heavy sea. An increase of beam on the other hand gives a greater area in the top and bottom members (the decks and garboards) to resist the bending strain. These vessels will have twin screws driven by triple expansion engines and have a longitudinal bulkhead fore and aft. Only one opening will exist in this bulkhead, so that in a collision the inflowing water can only gain access to one side of the ship. Rolling chambers, a simple and effective device lately described in these pages,* will be used to check rolling. The dining saloon will be on the upper deck and therefore above the bulkheads.

Two somewhat similar steamers are being built by Harland

& Wolfe, of Belfast, for the White Star line, and are also expected to rival, if not surpass, the speed of the "Umbria" and "Etruria."

From the December report of the Chief of the United States Bureau of Statistics, the following figures of exports for the month and year are condensed.

The value of exports of breadstuffs for the periods ending Dec. 31, 1887, was as follows:

	Month.	Six months.	Year.
1887.....	\$10,282,099	\$73,642,919	\$158,301,768
1886.....	13,045,346	78,360,454	148,123,020
Per cent.....	D. \$2,763,247	D. \$4,317,515	I. \$10,178,748
	21.2	5.9	6.8

The value of beef, hog and dairy products was as follows:

	Month.	Year.
1887.....	\$8,025,318	\$87,298,580
1886.....	8,985,168	86,035,346
Per cent.....	D. \$959,880	I. \$1,262,334
	10.7	1.5

For the six months ending Dec. 31, the quantities exported were:

	1887.	1886.	Inc. or Dec.	P.c.
Corn, bushels.....	12,545,010	17,057,570	D.	29.4
Wheat, bushels.....	44,664,558	51,585,544	D.	13.5
Flour, barrels.....	6,201,972	5,551,444	I.	11.7

For the month of December the quantities exported were:

	1887.	1886.	Inc. or Dec.	P.c.
Corn, bushels.....	2,178,973	3,320,225	D.	34.3
Wheat, bushels.....	4,226,316	7,981,731	D.	45.9
Flour, bushels.....	1,139,836	943,358	I.	22.0

The average values for the six months were:

	1887.	1886.
Corn, per bushel.....	50.9 cts.	47.7 cts.
Wheat, per bushel.....	85.8 cts.	84.9 cts.
Flour, per barrel.....	\$4.56	\$4.47

Some experiments have been made on the Fort Wayne, Cincinnati & Louisville, on the use of natural gas on locomotives. The gas under the natural high pressure, 350 to 650 lbs. per sq. in., is stored in cylindrical steel reservoirs and carried on a special car behind the tender. It is also proposed to convey natural gas in tank cars. As natural gas, however much compressed, is enormously more bulky than coal for an equal heating power, it may well be doubted whether the experiments will ever prove a financial success, and as natural gas is easily and cheaply conveyed in pipes, it is difficult to see how transport in cars is economically advisable, except in very special cases where the use of a gas free from sulphurous fumes, gives, irrespective of cost, advantages not attainable with coal. Such cases, however, are rare, especially as producer gas as used in the Siemens Martin furnace can be easily and cheaply made from very inferior coal.

The disastrous derailment near Haverhill, Mass., on the Boston & Maine last week Tuesday, seems, so far as can be discovered, to have resulted from a broken flange, though the Massachusetts Commissioners are making an investigation which is not yet completed. It appears that the Boston & Maine has only recently decided to abolish the non-automatic vacuum for the Westinghouse automatic brake, and that it may be regarded as a fortunate happening that the train in this instance was equipped with the automatic, which somewhat mitigated the effects of the derailment. The tank was an iron one and crushed the cars in a moment. One of the men in the tank house was a book agent who had gone in there to see the trackmen. Fourteen of the victims of the disaster are now dead.

The rotary steam snow shovels are reported to have done good work in clearing away the snow on the lines of the Northern Pacific during the recent severe snow-storms. A dispatch from Minneapolis states that one rotary shovel cleared over 300 miles of track in 16 hours, the snow being in many places 15 ft. deep.

NEW PUBLICATIONS.

A new trade paper appears under the name of the *American Contractor*. It is published weekly, at 98 Duane street, by the American Contractor Co., and the prospectus announces that it "is to be devoted solely to the interests of the contractor, or he who executes designs created by the engineer or architect." The editor is Mr. S. D. V. Burr, who has long been a writer for the technical press of New York.

Train Accidents in December.

COLLISIONS.

REAR.

2d, on Southern Pacific, near Mojave, Cal., a freight train ran into some cars standing on the main track, wrecking an engine and 10 cars.

2d, on Burlington & Missouri River, at Culbertson, Neb., a freight train ran into the rear of a preceding freight standing on the main track, wrecking 2 engines, caboose and several cars. A dense fog prevailed at the time.

3d, on New York, Lake Erie & Western, at Greycourt, N.Y., a freight ran into a preceding freight, damaging the engine, caboose and 5 cars.

3d, on Chicago, St. Louis & Pittsburgh, near Columbus, O., a passenger train ran into the rear of a freight, wrecking the engine and 4 cars. There was a dense fog at the time.

3d, on Norfolk & Western, at Radford, Va., a freight train struck some coal cars in the yard, damaging the engine and 4 cars.

4th, on Lake Shore & Michigan Southern, near Adrian, Mich., a rear collision between a freight and a passenger train under these circumstances: The freight broke in two before reaching Adrian, and from that point the engineman went back after the detached portion, leaving word with a yardman to hold the track for him. This was not done, and a passenger train followed the freight engine. After running some distance, it was seen that the latter had recovered its train, and was coming toward the yard. The passenger train was stopped, and had commenced backing when the

freight train struck it, badly damaging the freight engine and 3 cars.

4th, on Chicago & Northwestern, near Iroquois, Dak., a passenger train stalled in a snow drift was run into by a following passenger train, damaging the engine and rear car; 2 trainmen and 7 passengers injured. A flag was sent back, but was not observed.

4th, on Denver & Rio Grande, near Soldier Summit, Utah, the caboose and 11 cars of a freight train, which had been cut in two for the purpose of moving it in sections up a steep grade, got away from a brakeman, and, after running back down grade for some distance at high speed, finally jumped the track at a curve, and all the cars were thrown down a precipice and completely wrecked. A man asleep in the caboose was killed. The brakeman jumped off when he found the cars could not be controlled.

5th, on Illinois Central, at Amboy, Ill., a passenger train ran into the rear of a freight train which was standing on the main track, wrecking an engine, caboose and 8 cars, and killing 2 trainmen.

6th, on Chicago & Grand Trunk, near Goodell's, Mich., a freight train broke in two while descending a heavy grade. The engine side-tracked the front end of the train and in returning for the detached section came in collision with it; 2 trainmen killed and 2 injured.

7th, on Norfolk & Western, near Ingleside, W. Va., a freight train broke into several parts, which afterwards ran together, damaging 11 cars.

7th, on Kansas City, St. Joseph & Council Bluffs, at Percival, Ia., a freight ran into the rear of a passenger train which had been delayed on account of a hot-box, partially telescoping the rear sleeper and wrecking the freight engine and 10 cars; 2 trainmen, 2 passengers and a tramp injured, and 2 tramps killed. The passenger conductor sent the train boy back to flag the freight but the boy could not get back far enough.

8th, on New York, New Haven & Hartford, near Milford, Ct., a freight train broke in two and the rear section ran into the forward one, piling 5 or 6 cars up in a bad wreck, which extended across both tracks.

9th, on Rome, Watertown & Ogdensburg, at Webster, N.Y., a passenger train ran into the rear of a freight train, several cars of which did not clear the main track, wrecking an engine and several cars.

9th, on Louisville & Nashville, near Clarksville, Tenn., a freight ran into a preceding freight, doing some damage.

9th, on Baltimore & Ohio, near Benwood, W. Va., a passenger train ran into the rear of a freight train; engine and several freight cars wrecked.

9th, on Chicago, Burlington & Quincy, at Pacific Junction, Ia., a freight ran into another freight which was just going on to a siding, damaging an engine and several cars; a brakeman injured.

9th, on Chicago & Alton, at Lincoln, Ill., a freight train broke in two while descending a grade and the rear section ran into the forward one, damaging several cars.

9th, on Cincinnati, New Orleans & Texas Pacific, at Darwin, Tenn., a freight train ran into a preceding freight; the engine overturned and with several cars was badly damaged, fireman killed and engineer injured.

10th, on Kansas City, Ft. Scott & Gulf, near Olathe, Kan., a freight ran into a preceding freight, wrecking an engine, caboose and several cars. The wreck took fire and 2 cars loaded with cattle and hogs were burned up.

10th, on New York, Chicago & St. Louis, near Fostoria, O., a freight ran into a preceding freight which had stopped at a coal chute, wrecking the engine, caboose and 6 cars, and injuring a trainman.

10th, on Syracuse, Geneva & Corning, at Rock Stream, N.Y., a freight ran into the rear of a preceding freight, wrecking an engine and several cars.

11th, on New York, Pennsylvania & Ohio, near Akron, O., a freight ran into a preceding freight and the engine and several cars went over an embankment, making a bad wreck; 2 trainmen fatally injured.

12th, night, on Atchison, Topeka & Santa Fe, near Los Angeles, Cal., a construction train ran into a lot of cars standing at a gravel pit, doing some damage; conductor killed and 4 laborers injured.

12th, on Pennsylvania, near West Greensburg, Pa., a freight train broke into three parts and 5 cars were badly damaged by the detached sections colliding.

13th, on Philadelphia & Reading, at Minersville, Pa., a train, consisting of an engine and 13 heavily loaded cars, which had become unmanageable at Thomaston, Pa., came down a grade and ran into a coal train, damaging the engine and wrecking several cars. Both cylinder heads in the engine are said to have been blown out in the attempt to control the speed, and one of the side-rods was broken and the loose end revolved for some two miles. The engineman was hurt in jumping. A telegraph operator riding in the engine jumped off as the train was passing over a bridge, and in falling grasped the rail; just then a train came along and crushed his hand, and he fell into the river and broke his leg.

16th, on Peoria & Pekin Union, in Peoria, Ill., a Central Iowa pay-car train ran into the rear of a Toledo, Peoria & Western passenger train, damaging an engine and several cars.

16th, on Chicago & Atlantic, in Chicago, Ill., a passenger train ran into a stock train, damaging the engine and several cars.

16th, on Cincinnati, Hamilton & Dayton, at Ottawa, O., a freight train broke in two while going on a siding and the rear section ran into the forward one, damaging several cars.

18th, on New York, Lake Erie & Western, at White House, N.Y., a passenger train ran into a freight under the following circumstances: Train No. 3 was about two hours late, so that when it reached White House it was running on the time of No. 29. An east-bound freight which was on the side track waiting for 29 took train No. 3 for the former and pulled out on the main track just in time to be struck by 29. Both engines and a number of cars were badly wrecked and travel was stopped about ten hours. One engine injured by jumping.

19th, on New York, Lake Erie & Western freight ran into the rear of a Buffalo, Rochester & Pittsburgh freight at Palen's Switch, N.Y., wrecking an engine and 15 cars; 2 trainmen fatally injured.

19th, on New York, New Haven & Hartford, at New London, Conn., a passenger train approaching the station struck a misplaced switch and was turned onto the track leading to the ferryboat and collided with an engine which was standing there waiting to take a passenger train from the boat. The engineman of the passenger train reversed his engine and the man on the other engine used steam to help him hold his train, but they narrowly escaped going into the river.

19th, on Norfolk & Western, near Liberty, Va., a freight train ran into rear of preceding freight train, damaging engine and 9 cars and blocking the track 12 hours. A fireman injured.

20th, on Wabash, near Mexico, Mo., a freight ran into a preceding freight, piling up an engine and a number of cars in a bad wreck.

20th, on New York, New Haven & Hartford, at Westfield, Mass., a passenger train ran over a misplaced switch and into some freight cars standing on a side track. Two

* See page 816, *Railroad Gazette*, Dec. 16, 1887.

passengers were injured, one of them by being thrown against a hot stove.

21st, on New London Northern, at South Vernon, Vt., freight train ran into the rear of a preceding freight train, damaging the engine.

22d, on Lehigh Valley, near Allentown, Pa., a freight ran into a preceding freight, wrecking an engine and 10 coal cars.

22d, on Norfolk & Western, at Radford, Va., a freight train ran into a car standing in the yard. A wrong signal was given.

24th, on Norfolk & Western, near Ingleside, W. Va., freight train ran into the rear of a preceding freight, damaging engine and 3 cars.

25th, on Baltimore & Ohio, in Philadelphia, Pa., passenger train ran over a misplaced switch and into a lot of coal cars, doing considerable damage.

25th, on Baltimore & Ohio, at Thornport, O., a freight ran into a preceding freight, damaging the engine, caboose and 1 car; 3 trainmen injured.

27th, on Long Island road, in Brooklyn, N. Y., a passenger train ran into a preceding passenger train, damaging the engine and the rear car; 2 trainmen and 3 passengers injured.

27th, on Burlington & Missouri River, at Dawson, Neb., a passenger train ran over a misplaced switch and into the rear of a switching freight train, wrecking the engine and 5 freight cars; engineer injured.

29th, on Burlington, Cedar Rapids & Northern, at Ely, Ia., a passenger train stuck in a snow-drift was run into by a light engine, the rear car being telescoped; three passengers injured.

29th, on Fremont, Elkhorn & Missouri Valley, near Fremont, Neb., a snow-plow train ran into the rear of a freight train, wrecking an engine and several cars.

30th, on Utah & Northern, near Dillon, Mont., a coal train broke in two and ran back down grade *forty-eight miles* into a following freight, wrecking the engine and several cars; fireman killed and engineer injured.

31st, on Chicago, Milwaukee & St. Paul, at Shermerville, Ill., a passenger train ran into the rear of a freight train in a blinding snow-storm, wrecking the engine, caboose, mail and several freight cars; 2 trainmen injured.

31st, on Chicago & Atlantic, at Wilders, Ind., a stock train slackening speed for a crossing was run into by a closely following stock train, wrecking the engine, caboose and several cars. The wreck took fire and the caboose and one car burned up. A brakeman was caught in the wreck and burned to death. A heavy snow-storm prevailed at the time.

31st, 4 p. m., on Manhattan Elevated, at the 34th street junction, New York City, a train consisting of an engine and one passenger car, approaching the main line from the branch, struck the side of a car in a main line train which was just starting from the station. The car was pushed considerably to one side and lodged upon the sleepers of a turnout next to the main track. The passengers had a few moments' warning and moved away from the point of danger, so that only 2 were injured. The engineman of the branch train apparently became confused and pulled the throttle instead of the brake lever as he approached the stopping place.

31st, on Wabash Western, at Hull's Point, Mo., a passenger train ran into a freight car standing on the main track, the engine being overturned, seriously injuring engineer and fireman.

BUTTING.

3d, on Pennsylvania, near Bordentown, N. J., butting collision between a freight train and a switching freight, wrecked both engines and 3 cars and injured 2 trainmen.

4th, on New York, Pennsylvania & Ohio, near Akron, O., butting collision between a freight train and a light engine wrecked both engines and a dozen cars; 2 trainmen injured by jumping.

5th, on Northern Pacific, near Selah, W. T., butting collision between two freight trains, wrecking the engines and 11 cars. One engineman's watch was 8 minutes slow.

6th, on New York, Pennsylvania & Ohio, at Kent, O., a butting collision between two freight trains wrecked both engines and 12 cars.

6th, on Cleveland, Columbus, Cincinnati & Indianapolis, at Springfield, O., butting collision between a passenger train and a freight, damaging both engines.

8th, on Duluth, South Shore & Atlantic, near Baraga, Mich., butting collision between a light engine and a freight train, doing considerable damage.

8th, on Northern Pacific, near Tamarack, Minn., butting collision between two freights wrecked the engines and quite a number of cars; 2 trainmen killed and 1 fatally injured.

10th, on International & Great Northern, near Lark, Tex., a butting collision between two freight trains caused one of the engines to explode its boiler and badly wrecked the other engine and 20 cars. A tramp stealing a ride fatally injured.

11th, on Detroit, Grand Haven & Milwaukee, in Detroit, Mich., butting collision between two switching freights wrecked an engine and several cars.

11th, on Newport News & Mississippi Valley, near Clifton Forge, Va., butting collision between two freights, wrecking the engines and several cars, and killing 3 trainmen.

14th, on St. Louis, Iron Mountain & Southern, near Little Rock, Ark., butting collision between two freight trains wrecked the engines and 25 cars.

14th, on New York & New England, at South Milford, Mass., butting collision between two passenger trains, damaging the engines and the baggage cars; baggageman killed and a conductor injured. One train was running on the time of the other by verbal orders given without the train dispatcher's authority.

16th, on East Tennessee, Virginia & Georgia, near McVille, Ga., butting collision between a freight train and a construction train, damaging the engines and injuring a trainman.

16th, on Central Pacific, at Irvington, Cal., 7 freight cars standing on a siding were struck and set in motion by a switching freight and ran back down grade into the head of a freight train, wrecking an engine and several cars; engineer killed.

16th, on Chicago & Northwestern, near Mechanicsville, Ia., butting collision between two freight trains wrecked both engines and several cars; 1 trainman killed and 1 injured.

17th, on Northern Pacific, near Thompson Falls, Mont., butting collision between two freights, wrecking the engines and 12 cars, and killing 3 trainmen.

17th, on Pittsburgh, near Littleton, Mass., butting collision between a freight train and a gravel train, ditching the engine and 2 cars of the former train. Fire broke out and 4 cars were burned up; 1 trainman killed and 2 injured.

18th, on Delaware & Hudson Canal Co.'s road, at Fort Edward, N. Y., a butting collision between two freight trains piled up both locomotives and quite a number of cars in a very bad wreck; 1 trainman injured.

19th, on New York, Lake Erie & Western, in Port Jervis, N. Y., butting collision between two locomotives.

20th, on Chicago, Milwaukee & St. Paul, at Lakefield, Minn., butting collision between a passenger train and a

freight; 1 engineer killed and the other fatally injured. A heavy snow-storm prevailed at the time.

20th, on Illinois Central, near Cherokee, Ia., butting collision between two light engines; 1 trainman killed and 2 injured.

20th, on Chicago & Alton, in Bloomington, Ill., butting collision between two switching locomotives; engineer injured.

20th, on St. Louis, Iron Mountain & Southern, near Newport, Ark., butting collision between a passenger train and a freight wrecked both engines and several cars; 1 trainman killed and 3 injured. The baggage and express cars overturned and took fire, but the flames were speedily extinguished.

21st, on Chicago, Milwaukee & St. Paul, at Jackson Junction, Ia., butting collision between 2 passenger trains, injuring 2 trainmen.

21st, on Chicago, Milwaukee & St. Paul, near Calmar, Ia., butting collision between 2 passenger trains, both engines and several cars being overturned and piled up in a bad wreck; 2 trainmen fatally and 1 severely injured.

22d, on Cincinnati, Lebanon & Northern, near Idlewild, O., butting collision between two passenger trains, damaging both engines; 3 trainmen and 4 passengers injured.

22d, on Missouri Pacific, at Jefferson City, Mo., a butting collision between two passenger trains damaged both engines.

22d, on Newport News & Mississippi Valley, in Lexington, Ky., butting collision between two switching engines.

22d, on Illinois Central, near Rock Rapids, Ia., butting collision between two construction trains; 2 trainmen fatally injured. A heavy snow-storm prevailed at the time.

23d, on Baltimore & Ohio, at Spring Hill, O., butting collision between two passenger trains owing to a misunderstanding as to which train was to take the siding. Both engines badly damaged.

27th, on Pittsburgh, Fort Wayne & Chicago, near Sheffield, Ind., a freight train ran over a misplaced switch and into the head of a construction train, damaging both engines and 8 cars. A laborer was slightly injured.

28th, on Chicago, Milwaukee & St. Paul, at Western Union Junction, Wis., two freight trains which were backing toward each other collided, injuring 2 trainmen. Both cabooses and several cars were wrecked and burned up.

28th, on New York, Lake Erie & Western, near Thompson, Pa., butting collision between a New York, Lake Erie & Western freight and a Delaware & Hudson Canal coal train. The former was ordered to meet two trains at the station named. One of the trains had pulled into the side track, when the engineman, who was waiting, at once started his train, without a signal from the conductor, apparently forgetting that there was another train to come. He had gone but a few rods when he met it. Both engines and a number of cars were wrecked, and one of the former was tipped down a bank.

30th, in Evansville, Ind., butting collision between an Evansville & Terre Haute passenger train and a Peoria, Decatur & Evansville freight train, damaging both engines and several cars; 1 trainman injured.

31st, on Cincinnati, New Orleans & Texas Pacific, near Greenville, Ky., butting collision between two passenger trains running at high speed, making a very bad wreck. A baggage and a smoking car went over an embankment, and another car mounted the engines, the occupants being scalded by escaping steam. A mail and baggage car took fire and burned up. Five trainmen and 1 passenger killed, and 8 trainmen and 11 passengers injured. The accident was caused by one of the conductors misreading orders, reading Someret for Summit.

31st, on New York, Pennsylvania & Ohio, near Meadville, Pa., butting collision between a passenger train and a freight which consisted of 2 engines and 60 cars, making a bad wreck. Four trainmen and 1 passenger killed, and 16 passengers injured. The passenger train was two hours late; the conductor and both enginemans of the freight were ignorant of this fact, and all three of them neglected to examine the train register before leaving the yard. The yard men made unavailing efforts to recall the freight.

CROSSINGS.

7th, a Savannah, Florida & Western freight train ran into a Brunswick & Western freight train at the crossing in Waycross, Ga., wrecking an engine and several cars; engineer slightly injured.

8th, a Northern Pacific freight ran into a St. Paul, Minneapolis & Manitoba freight at the crossing near St. Cloud, Minn., and engine and 11 cars were wrecked. There was a dense fog at the time.

15th, a Baltimore & Ohio passenger train ran into an Ohio Central freight train at the crossing in Fostoria, O., the engine of the passenger train striking the tender of the freight engine, doing considerable damage.

27th, a Terre Haute & Indianapolis passenger train ran into an Illinois Central freight train at the crossing in Vandalia, Ill., damaging an engine and 1 car.

29th, in Hammond, Ind., a Chicago & Atlantic passenger train was run into by a Michigan Central freight train, overturning and badly damaging a car; 1 passenger injured.

DERAILMENTS.

DEFECTS OF ROAD.

2d, on New York, Lake Erie & Western, in Ridgewood, N. J., engine of a passenger train derailed by a defective switch.

3d, on St. Paul & Duluth, near Spirit Lake, Minn., 8 cars of a freight train were thrown from the track by a broken rail and wrecked.

4th, on Baltimore & Ohio, near Independence, O., owing to the spreading of the rails, an engine and 10 cars of a freight train were derailed and thrown over a 25-ft. embankment; engineer killed and fireman fatally scalded.

6th, on Philadelphia & Reading, near Bridgeport, Pa., freight train derailed by spreading of rails.

7th, on Chicago, St. Paul, Minneapolis & Omaha, at West Superior, Wis., passenger train thrown from the track by a broken rail. The baggage car overturned, injuring the baggageman.

15th, on Norfolk & Western, at Pembroke, Va., the tender and 1 car of a freight train derailed by a broken frog.

15th, on Pittsburgh, Fort Wayne & Chicago, in Valparaiso, Ind., 14 cars of a freight train were thrown from the track and badly wrecked by the breaking of a rail.

16th, on Fremont, Elkhorn & Missouri Valley, near Fremont, Neb., engine and 4 cars of a freight train went through a small bridge which was undergoing repairs. It is said that the engineer was unable to see the danger flag displayed, because he was pushing a snow-plow.

17th, on Philadelphia & Reading, near Lawton, Pa., passenger train thrown from the track by a broken rail.

19th, on Norfolk & Western, near Bluestone Junction, W. Va., switching engine derailed by a broken rail.

20th, on Manhattan Elevated, in New York city, a slowly moving passenger train was derailed near Franklin street station by a loose rail at a point where track repairs were in progress.

23d, on Wisconsin Central, near Fifield, Wis., several cars of a passenger train thrown from the track by a broken rail

and overturned; 1 passenger killed, conductor and 14 passengers injured.

26th, on Chicago, Milwaukee & St. Paul, near Rosemount, Minn., passenger train thrown from the track by a broken rail, and 2 passengers injured.

27th, on New York, Lake Erie & Western, near Nyack, N. Y., owing to a misplaced or defective switch the engine of a passenger train was derailed and overturned; engineer injured.

28th, on Missouri Pacific, at Hiawatha, Kan., passenger train derailed by a broken switch-rod.

28th, on Toledo, Ann Arbor & North Michigan, near Alma, Mich., several cars of a passenger train thrown from the track by a broken rail and overturned.

28th, on Louisville & Nashville, near Athens, Ala., a trestle gave way under a passing freight and 10 cars were thrown into the creek and badly wrecked; 1 brakeman killed.

29th, on Clearfield & Jefferson, near Great Bend, Pa., passenger train thrown from the track by a broken rail and one car overturned, injuring a passenger.

30th, on Pittsburgh & Western, near St. Petersburg, Pa., a trestle gave way under a mixed train, consisting of engine, 7 freight and 2 passenger cars. The engine got over safety, but the tender and all the cars went down into a gully. The wreck caught fire from the stoves and burned up. Six passengers injured.

DEFECTS OF EQUIPMENT.

7th, on Delaware & Hudson Canal Co.'s road, at Whallonsburg Station, N. Y., 3 cars of a passenger train derailed and wrecked, owing it is supposed to a broken wheel or axle under the tender. The wrecked cars were burnt up, as was also the station building.

8th, on Norfolk & Western, near Salem, Va., a car in a freight train was derailed by the breaking of a truck.

9th, on Norfolk & Western, near Ripplemead, Va., 9 cars of a freight train derailed and wrecked by the breaking of an axle under a coal car.

14th, on Norfolk & Western, near Oakvale, W. Va., a car in a freight train derailed by a broken axle, wrecking 3 cars.

22d, on Cincinnati & Muskingum Valley, near Crooksville, O., several cars of a freight train derailed by a broken wheel and thrown off a trestle.

23d, on Minnesota & Northwestern, near German Valley, Ill., express train, consisting of engine and 7 cars, was derailed by a broken axle, and after running on the ties for a little distance some of the cars rolled down the embankment and overturned; 24 passengers injured, 2 of them fatally.

NEGLIGENCE IN OPERATING.

5th, on St. Paul, Minneapolis & Manitoba, at Waverly, Minn., engine and 3 cars of a freight train were derailed by a misplaced switch and badly damaged.

5th, on Northern Pacific, at Billings, Mont., freight train derailed by a misplaced switch.

6th, on New York, Lake Erie & Western, at Middletown, N. Y., a freight train struck a coal car which had been accidentally switched to the main track, doing some damage.

13th, on Georgia Pacific, near Chocoloca, Ala., a freight train was derailed by a misplaced switch, wrecking the engine and several cars; 2 trainmen killed.

13th, on Chicago, Milwaukee & St. Paul, at Spaulding, Ill., freight train derailed by a misplaced switch and 6 cars wrecked.

17th, on Cincinnati, Hamilton & Dayton, at Ivorydale, O., a passenger train ran over a misplaced switch and the engine and one car were thrown over to one side, injuring a trainman.

19th, on St. Paul & Duluth, near Mahtowa, Minn., passenger train ran over a misplaced switch and the engine and all but the rear car were derailed and went over an embankment; engineer killed, fireman and 8 passengers injured. One of the cars caught fire, but it was soon put out with snow.

20th, on Norfolk & Western, near Cooper's, W. Va., a car which had run out of a side-track and escaped from the men in charge ran down a grade some distance and was derailed by one of the safety switches with which the steep grades are provided.

22d, on Louisville & Nashville, at Goodwin, Tenn., engine and 1 car of a freight train derailed by a misplaced switch and badly damaged.

22d, on Norfolk & Western, near Simmons Junction, W. Va., a car which had run out of a siding and escaped from the men in charge ran some distance down a grade and was derailed by a safety switch.

23d, on New York, New Haven & Hartford, at Westfield, Mass., a car in a freight train was derailed and ditched by a misplaced switch.

24th, on Norfolk & Western, near Pocahontas, W. Va., a car which had run out of a side track and escaped from the men in charge ran some distance down a grade and was derailed.

24th, Chicago, Milwaukee & St. Paul, near Clinton Junction, Wis., engine and baggage car of a passenger train derailed by a misplaced switch; 2 trainmen injured.

29th, on Pittsburgh, Cincinnati & St. Louis, at Connott, O., a freight train was derailed by a misplaced switch, wrecking the entire train; fireman killed.

29th, on Southern Pacific, near Beaville, Cal., engine and 5 cars of a freight train derailed by a misplaced switch.

UNFORESEEN OBSTRUCTIONS.

3d, on Missouri Pacific, near Kyle, Tex., a passenger train ran over a cow, ditching the engine, mail and baggage cars; a man riding on the engine was killed, engineer and fireman injured.

12th, on Louisville, New Orleans & Texas Pacific, near Greenville, Miss., a passenger train ran over a purposely misplaced switch and crashed into some coal cars standing on a siding, damaging the engine and wrecking 2 cars.

19th, on Norfolk Southern, at Tunis Switch, Va., a freight train was thrown from the track by a steel rail, which had been placed across the track by train wreckers, doing considerable damage; a man in the caboose was killed, 2 others injured.

19th, on Norfolk & Western, at Petersburg, Va., a freight ran over a purposely misplaced switch and into some cars standing on a siding, wrecking engine and 7 cars.

20th, on Pennsylvania, in New Brunswick, N. J., a freight train ran over a tramp walking on the track and 1 car was derailed.

24th, on Richmond & Danville, at Atlanta, Ga., passenger train derailed by a piece of wood wedged into a frog, apparently by train wreckers; engineer and fireman injured.

29th, on Alabama Great Southern, near Livingstone, Ala., passenger train derailed by a landslide, 2 cars being thrown from the track and upset; 16 passengers injured.

29th, on New York & Northern, at Lake Mahopac, N. Y., freight train derailed by ice on the track, a tank having burst in the night engine; and several cars ditched; 1 trainman slightly injured.

31st, on Louisville & Nashville, near Saxton, Ky., engine and 8 cars of a freight train derailed and ditched by a

boulder which had rolled upon the track; a tramp stealing a ride was killed, and 3 trainmen and a tramp injured.

UNEXPLAINED.

2d, on California Southern, near Colton, Cal., engine of a freight train derailed and ditched, injuring a brakeman.

4th, on Colorado Midland, near Glenwood Springs, Col., several cars of a freight train derailed and thrown off a trestle.

4th, on Northern Pacific, near Palouse Junction, W. T., passenger train derailed.

4th, on St. Louis & San Francisco, at Grant, I. T., engine and several cars of a freight derailed, doing considerable damage.

5th, on Norfolk & Western, in Roanoke, Va., freight train derailed, wrecking 4 cars.

5th, on Chicago & Northwestern, near Iron River, Mich., passenger train derailed, damaging several cars.

5th, on Grand Rapids & Indiana, near Wayland, Mich., a flat car in a freight train was derailed and 14 cars were piled up in a bad wreck.

5th, on New York, Lake Erie & Western, near Dixon's Switch, N. Y., passenger train derailed.

6th, on Philadelphia & Reading, near Bridgeport, Pa., a car in a freight train derailed at a switch and with 2 other cars was badly damaged.

9th, on Northern Pacific, near Kimberly, Minn., engine and several cars of a freight train were derailed and wrecked; 2 brakemen killed and the engineer fatally scalded.

10th, on Southern Pacific, near Tehachipi, Cal., engine and several cars of a coal train derailed and badly damaged.

10th, on Norfolk & Western, at Oakvale, W. Va., a car in a freight train derailed.

10th, on New London Northern, at Amherst, Mass., freight train derailed.

11th, on Cleveland, Akron & Columbus, near Westerville, O., 10 cars of a freight train derailed and wrecked.

12th, on Missouri Pacific, at Chouteau, I. T., 18 cars of a stock train derailed and thrown over an embankment. The cars were badly wrecked and some cattle were killed.

13th, on Old Colony, at Northboro Centre, Mass., passenger train derailed.

14th, on Fort Worth & New Orleans, near Waxahachie, Tex., construction train derailed and several cars wrecked.

14th, on New York Central & Hudson River, near Charlotte, N. Y., 8 coal cars derailed.

16th, on Norfolk & Western, at New River Junction, Va., a car in a freight train derailed, blocking the track several hours.

21st, on Pennsylvania, near Bushong Furnace, Pa., 10 cars of a freight derailed and wrecked.

22d, on Norfolk & Western, near Salem, Va., a freight train was derailed, blocking the road 5 hours.

22d, on Chicago, Burlington & Quincy, at Quincy, Ill., engine and 1 car of a passenger train derailed, the former going over an embankment; fireman killed and engineer injured.

23d, on Central of Georgia, near Augusta, Ga., a mixed train was derailed on a trestle and five freight, one baggage and a passenger car were thrown off the trestle and badly wrecked; 2 trainmen and 5 passengers injured. The wreck caught fire, but the flames were soon put out. One thousand feet of the trestle was knocked down.

23d, on Norfolk & Western, at New River Junction, Va., a car in a freight train derailed.

24th, on Savannah, Florida & Western, near Jacksonville, Fla., a car in a freight train was derailed and struck the end of the bridge over St. Mary's River; the whole structure and 5 cars went down into the stream.

24th, on Boston & Maine, at Haverhill, Mass., passenger train derailed.

25th, on Wabash, near Newport, Ill., a freight train derailed and several cars wrecked.

26th, on International & Great Northern, in Troup, Tex., passenger train derailed.

28th, on New London Northern, at Belchertown, Mass., locomotive of a passenger train derailed.

28th, on Elmira, Cortland & Northern, at Cazenovia, N. Y., engine of a freight train derailed and ditched, blocking the track all day.

29th, on Lehigh Valley, at Jedd, Pa., a passenger train derailed, doing considerable damage, the engine going over an embankment.

30th, on West Shore, in Jersey City, N. J., 7 cattle cars were derailed and thrown from a trestle to the street below and badly wrecked.

31st, on Burlington, Cedar Rapids & Northern, near Cedar Rapids, Ia., freight train derailed; engine badly damaged.

OTHER ACCIDENTS.

2d, on Philadelphia & Reading, near East Mahanoy Junction, Pa., the engine of a freight train exploded its boiler; 3 trainmen killed and 2 injured.

7th, on Atchison, Topeka & Santa Fe, in Topeka, Kan., the truck under a baggage car broke just as a passenger train pulled into the station.

17th, on Baltimore & Ohio, near Whitehall, Pa., the boiler of a freight engine exploded; 3 trainmen injured.

19th, on New York, Lake Erie & Western, at West Englewood, N. J., engine of a passenger train broke a parallel rod, injuring the engineer.

20th, on Norfolk & Western, at Tylers, Va., an axle of a freight car broke.

24th, on Southern Pacific, near Keene, Cal., draw-bar of a car in a passenger train pulled out.

30th, on Burlington & Missouri River, near Crete, Neb., a baggage car of a passenger train was found on fire while the train was running at a rapid rate. Water was soon procured from a tank, but most of the body of the car and some of the baggage and mail was destroyed.

A summary will be found in another column.

TECHNICAL.

Iron and Steel.

The Columbia and Liberty Iron Works, situated near Woodstock, Va., embracing 18,400 acres of land and other valuable property, has been sold to G. W. Pierson & Co., of Philadelphia, \$51,000.

Smith Bros. & Co., Alleghany, Pa., have purchased a tract of land upon which they will build a large steel mill.

Architectural iron works are being built at Dalton, Ga., by the Manly Manufacturing Co., of which R. P. Manly is President, T. W. Hamilton Secretary, and T. R. Jones Treasurer. Will manufacture bridge work, vaults, fencing, etc. W. B. Farrar has the contract to erect a building 64 by 128 ft.

The rolling mill and nail works of the Oxford Iron Co., at Oxford, N. J., have shut down, and hundreds of hands are thrown out of employment. The furnaces and mines are still running.

The Pratt & Whitney Co., Hartford, Conn., increased the number of their employees last year from 500 to 700 and now have the last named number at work on full time. They have just shipped the last lot of an order of 150 Gardner guns for the Italian government, and as the American branch of the

Hotchkiss Ordnance Co., England, have begun work on some guns for the United States Navy.

The Peekskill Furnace property, at Peekskill, N. Y., including the narrow gauge railroad leading from the furnace to the Croft mine in Putnam County, and the mine itself, was sold at referee's sale on Dec. 28, and was purchased by Lawrence Farrell, of New York, representing Frederick Livingston and W. D. Schoonmaker, of New York, and Joseph Cunningham, of Paterson, N. J., who represented Senator Jones of Nevada. The price paid was \$33,600.

Lean & Blair, engineers and contractors, at Pittsburgh, are erecting a 20-ton Lash steel melting furnace for the Standard Steel Casting Company, at Thurlow, Pa. It is the intention to use producer gas in the furnace when completed, and as this is largely in the nature of an experiment the results will be watched for with considerable interest. Until now the furnace has only been used when natural gas was available.

The Ashland Steel Works, about 20 miles north of Baltimore, blew out on the 17th. The cause of the stoppage is said to be the scarcity of coal because of the Reading strike.

The Lorain Manufacturing Company, of Lorain, O., are receiving bids for an iron foundry building to be T-shaped, each arm 170 x 100 ft., to be completed May 1, 1888.

Car Notes.

The Boston & Albany shops at Springfield are building 50 box cars, 34 ft. long and of 40,000 lbs. capacity.

Manager Harris and other officials of the Chicago, Burlington & Northern were in Chicago last week to let the contracts for the building of 1,500 box cars. Representatives of car shops from all parts of the country were present and bid on the work, which was finally awarded to the Lafayette Car Works of LaFayette, Indiana.

The Louisville & Nashville has contracted with the Ensign car works to build it 1,000 platform cars of 60,000 lbs. capacity each.

D. L. Mitchell & Co., of New Orleans, La., are negotiating for a site for car works which a Northern company contemplate erecting. The works, if built, will employ from 600 to 800 hands.

The car works at Dauphin, Pa., owned by Scholl & Schoop, employing about 150 persons, were destroyed by fire last week. Loss \$75,000.

The contract to manufacture 400 cars for the Chicago, Milwaukee & St. Paul has been completed by the Muskegon Car Company. The contract price for the work was in the neighborhood of \$200,000.

The Kingston & Pembroke Car Works Co., Kingston, Ont., has contracts to the value of \$300,000 on hand. The largest order is from the Canadian Pacific Railway.

Messrs. Harris & Co., St. John, N. B., have been awarded the contract to build ten freight cars of the Eastman heater pattern for the Intercolonial Railroad, for the carriage of all kinds of perishable goods. The cars will be utilized this winter.

The Delaware & Hudson Canal Co. has ordered 400 cars of Murray Dougall & Co., of Milton, Pa., and 100 of the Lehigh Car Co., of Stenton, Pa.

Steam Heating Notes.

The system of continuous heating introduced by the Erie Car Heating Co., is being tried on the Enon Valley Branch of the Pennsylvania Co., and an experimental train will be shortly running on the Lake Shore & Michigan Southern.

The rapid progress in heating trains by steam from the locomotive during the last year is well illustrated by a remark by Mr. Martin, inventor of the system bearing his name: "The Boston & Albany, in March, 1887, was the third road to adopt this system. I have to-day taken an order from the twenty-first road to use it."

The Dunbar Double Car Chair.

The Scarratt Furniture Co., of St. Louis, has lately brought out the Dunbar car chair, an improved reversible seat for two persons. It is claimed that this chair possesses the following advantages: It has four arms, two to each occupant, instead of one centre arm common to both passengers as usual in double chairs. Each occupant can thus be independent. The arms are hinged as the back is inclined and their relation to the back is also constant, making the chair equally comfortable at all inclinations. The handles for adjusting the inclination of the back are easily accessible from any position of the occupant. The back not only rights itself, but assists the occupant to rise, while in most styles of adjustable chairs the occupant has to sit upright and then pull up the back. The rests for the head and feet have been carefully designed with a view to comfort.

Test of the Daft Motor.

A successful trial was made this week on the electric road built in Easton, Pa., by Prof. Leo Daft. The road is 1 mile long and extends up College Hill. The grade up the hill is the greatest upon which any electric road has been built, being about 8½ ft. in 100. This grade is nearly 1,000 ft. long. The current was supplied by a 50 horse-power dynamo supplying a 15 horse-power motor on each car. The trial trip was made with 18 people on the car, and with two-thirds of the power in use.

Stamped Moldings.

Basswood may be enormously compressed after which it may be steamed and expanded to its original volume. Advantage has been taken of this principle in the manufacture of certain kinds of moldings. The portions of the wood to be left in relief are first compressed or pushed down by suitable dies below the general level of the board, then the board is planed down to a level surface, and afterward steamed. The compressed portions of the board are expanded by the steam, so that they stand out in relief.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

The New Jersey Act of Feb., 1884, authorizes the appointment of a receiver to take possession of any railroad which has not been operated for more than ten days. An Act of 1880 provides that "any railroad company whose road is constructed at any seaside resort, not exceeding four miles in length, and which was built and intended merely for the transportation of summer travelers and tourists" shall be accepted from the operation of the Act of February, 1874. The Vice Chancellor has just decided that this amendment has no application to a railroad, organized under the general railroad law passed in 1873, which declared its purpose of doing a general business in the transportation of passengers and freight, and constructed its road from Cape May City to the steamboat landing, in all less than four miles in length. The Vice Chancellor therefore says: "Unless the company commences operations and runs its trains to carry both freight and passengers within five days from the time a copy of the order to be made in this case shall have been served upon one of its officers, I shall advise the appointment of a receiver to operate the said road under the statute."

In Missouri, the master to whom the question was referred as to the compensation to be allowed, the two receivers of the Wabash, St. Louis & Pacific R. Co. reported that \$112,500

each was a proper compensation for three years' services. The ideas of the master were too large for the United States Circuit Court, which cuts the figure down to \$70,000. Another case in New York deals with the compensation of trustees. A mortgage for \$2,600,000, given to trustees for the security of the holders of the mortgage bonds, provided that the trustees should be allowed a reasonable compensation for executing their trust. The Federal Court holds that, in the defense of an action to set aside the mortgage, the trustees were entitled to only 1 per cent., the compensation allowed by the U. S. statutes to trustees for receiving and paying out sums of more than \$10,000.³

Carriers of Goods and Injuries to Property.

In Arkansas the Supreme Court lays it down that in assessing the value to the owner of land taken by a railroad for its right of way, the question is, what is the market value of the land; what price could the owner obtain for it after a reasonable opportunity to make a sale? What it may be worth to the railroad company, or what they would be willing to pay to get it, or what amount of money they save by getting it are irrelevant questions.⁴

In Kentucky a railroad was built on the public road directly adjacent to plaintiff's residence lot, and between his lot and the road. The lot was situated in a corner, and railroad raised the grade of the other public road from 15 to 30 ft., to cross its road bed at grade, leaving plaintiff's lot in the low corner between its road bed and the public road as raised by the railroad. The Court of Appeals holds that although the building of the road was by legislative grant, yet, where it deprived an adjacent owner from enjoying his premises by preventing ingress or egress, or flooded the same with water, or rendered them unhealthy, the injury was actionable.⁵

In Texas an owner brought an action to recover special damages caused by the construction of defendant's railroad along the street in front of his property, impairing the use of the street. The Supreme Court rules that plaintiff was not barred from recovery, on the ground that other property owners in the same locality had also been injured in the same manner.⁶

In Nebraska, the Supreme Court holds that where a railroad bridge is so negligently constructed across a river as to form an unlawful obstruction, and become a nuisance by causing an overflow of the river, no right of action accrues to a land owner until he sustains an actual injury caused by such unlawful obstruction—as by the overflow of his lands.⁷

The Wisconsin statutes make it the duty of a railroad to fence its road, depot grounds excepted, to keep cattle from straying on the right of way. In an action brought to recover for the killing of an ox upon defendant's railroad track, it appeared that at the place of the killing the right of way was fenced on the east side, but not on the west. Plaintiff testified that in seeking to ascertain the point at which the animal went upon the track, he discovered cattle tracks leading from the west side across the switch track on to the main track where the ox was killed; that he saw no other tracks than these upon the right of way between the depot grounds and the place of the killing. The evidence showed that at the place of the killing, which was 60 rods north of the station, there was a ditch and an embankment; that on the west side of the main track was a spur running parallel which it used for storing cars. It did not appear that this spur was ever used for loading or unloading freight, but towards the end where the grounds was level it had been used for loading tie. The Supreme Court affirms a verdict that the animal was not killed on "depot grounds" and that the railroad is liable.⁸

When a fire is caused by sparks escaping from the smokestack of a locomotive operated by a railroad corporation, a presumption of negligence on the part of the corporation arises, but may be rebutted by proof that, at the time of the fire, the best and most approved appliances known and in use to prevent the escape of fire were in use on the locomotive, and in good repair and condition, and operated by a skillful engineer in a careful manner. And uncontradicted testimony that the locomotive was then provided with the best spark-arrester yet discovered, that none has been invented that will arrest all sparks, and that the smoke-stack and arrester were daily inspected by competent mechanics, and found to be in good condition and repair, and that the engineer was competent will be sufficient for such proof. If a fire, started in combustible material which has accumulated on the right of way of a railroad corporation, is caused by sparks from one of its locomotives, no presumption of negligence on the part of the corporation arises from the mere fact of such accumulation; but it is a question of fact for the jury whether the failure to remove the material was negligence. These principles the Supreme Court of Texas applies in a recent case.⁹

Injuries to Passengers, Employes and Strangers.

In Iowa, a yardman in defendant's employ was ordered to couple to the train a car of lumber. The car had been improperly loaded, the lumber projecting too far forward, and in coupling the car the yardman was caught between the projecting lumber and the tender of the locomotive, and killed. The evidence showed that the order to deceased to couple the car was unqualified, and given at the last minute. The car was to be put immediately into the train for transportation. It was night, and the projecting lumber was seen by deceased only as he approached it by the light of his lantern. The Supreme Court decides that the deceased had a right to presume that the car was properly loaded, and he was not guilty of contributory negligence in not closely examining the car as to its readiness for shipment. In this case it appeared that it was the custom of the railroad to send its cars to the yards of certain lumber merchants to be loaded with lumber and attached to the train. The Supreme Court holds that it made no difference whether the car was in fact loaded by men in the employ of defendant or not; the loading was essentially the act of defendant, and it was its duty to see that the car was properly loaded.¹⁰ In the same state the same Court rules that where a fireman on a railroad train has been over the road, and had opportunity to learn the character of the road as to curves, grades and fences, and that of the country traversed and its use for pasture, but continues in his employment without objection, he assumes all risk arising from the unfenced condition of the road and consequent danger of encountering cattle on the track, or from the peculiarities of the road bed as to grades and curves. Where an unfenced railroad runs through pasture land, cattle must be expected on the track at any point, and it is not the duty of the company to warn employes engaged in operating trains on the road of the danger of encountering cattle.¹¹

In Minnesota in an action for killing a traveler, the negligence charged was the railroad's throwing snow from the railroad track upon the highway, at a crossing, the bank formed by which on one side was highest at the south end, and on the other side highest at the north end, thus rendering the highway impassable on the usual traveled track, and compelling travelers to enter the cut at the end where the bank was lowest on that side, and then follow the railroad track to a point at which they could get out on the opposite side; that this state of things had, to the knowledge of defendant, continued for several weeks, without its removing the obstruction; that while deceased, traveling the highway with a team, was on the railroad track making the crossing in the manner indicated, defendant's train,

running at a very high speed, and without any whistle being blown, or bell rung, to warn the travelers at the crossing, ran over and killed him. The Supreme Court affirms a verdict against the railroad.¹²

In Nebraska a verdict against a railroad where a man was killed while attempting to cross the track with his wagon at a crossing, the train being behind time and no signal being given, is affirmed by the Supreme Court.¹³ In Wisconsin, in a similar action, it appears that the crossing was a dangerous one, with the view of the railroad obstructed by brush in one direction; that on approaching the crossing the driver of plaintiff's team left his team and sleigh, and took a seat on a sleigh preceding his own, so muffled up that he could not well hear an approaching train, and with his back turned in the direction of the most dangerous approach to the crossing. The Supreme Court holds that the driver was guilty of gross contributory negligence, and that the plaintiff cannot recover for the injuries to his team.¹⁴ In another action of the same kind in the same state, it was shown that the crossing was a dangerous one, that the view of the railroad was obstructed on both sides, that the noises at the crossing were such as to render it difficult, without stopping his team, for plaintiff to hear the sound of an approaching train, and that plaintiff knew a train to be due at the crossing at the time. The Supreme Court holds that the failure of plaintiff to stop his team in order to ascertain if a train was approaching was contributory negligence.¹⁵

¹² *Re Del. Bay & Cape May R. Co.*, 9 Cent. Rep., 49.

¹³ *Central Trust Co. v. W. St. L. & P. R. Co.*, 32 Fed. Rep., 187.

¹⁴ *Dow v. M. & L. R. Co.*, 32 Fed. Rep., 185.

¹⁵ *Little Rock Junction Railway Co. v. Woodruff*, 5 S. W. Rep., 79.

¹⁶ *Louisville & N. R. R. Co. v. Finley*, 5 S. W. Rep., 753.

¹⁷ *Tex. & N. W. R. Co. v. Goldberg*, 5 S. W. Rep., 824.

¹⁸ *Omaha & Republic Valley Ry. Co. v. Stander*, 35 N. W. Rep., 183.

¹⁹ *Denwood v. C. M. & St. P. R. Co.*, 35 N. W. Rep., 299.

²⁰ *Gulf, Col. & S. F. Ry. Co. v. Benson*, 5 S. W. Rep., 822.

²¹ *Haugh v. C. R. I. & P. Ry. Co.*, 35 N. W. Rep., 116.

²² *Paton v. Cent. Iowa Ry. Co.*, 35 N. W. Rep., 149.

²³ *Phelps v. W. & St. P. R. Co.*, 35 N. W. Rep., 273.

²⁴ *Omaha, Niobrara & Black Hills R. R. Co. v. O'Donnell*, 35 N. W. Rep., 235.

²⁵ *Same v. Wis. & Minn. R. R. Co.*, 35 N. W. Rep., 282.

²⁶ *Seefeld v. C. M. & St. P. R. Co.*, 35 N. W. Rep., 278.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings of the stockholders of railroad companies will be held as follows:

West Virginia & Pittsburgh, annual meeting, at the office Baltimore, Jan. 24.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p.m., on the first Tuesday of each month.

The *New England Railway Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p.m. on the third Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* meets in Chicago the third Wednesday in each month.

The *Engineers' Club of St. Louis* meets the first and third Wednesday of each month till June.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *General Time Convention*, spring meeting, will be held in New York, April 11.

The *National Association of General Passenger and Ticket Agents* holds its annual meeting in St. Augustine, Fla., on March 20.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Illinois Central, 3½ per cent., semi-annual, payable March 1.

Rome, Watertown & Ogdensburg, 3 per cent., payable Feb. 15.

Connecticut Association of Civil Engineers and Surveyors.

The fourth annual meeting of this association was held at Hartford, Conn., on Jan. 10. It began with a business meeting, after which dinner was served. A paper was then read by E. P. Augur, of Middletown, on the "Adjustable Effluent Pipe for the Middlebury Water-Works." A discussion of Rental Value of Hydrant Services followed, after which a paper on a description of the Bath Water-Works by F. B. Dufry, contractor, was read. After supper F. W. Whitlock, C. E., read a paper on "A Method of Plotting by Rectangular Co-ordinates," and T. H. McKenzie, C. E., followed with a paper entitled "Mason Work." C. H. Bunce, of Hartford, was elected President of the Association, and D. S. Brinsmade was elected Secretary and Treasurer.

Engineers' Club of St. Louis.

At the regular meeting, Jan. 4, the following members were elected: Robert H. McMath, J. W. Schaub, James M. Sherman, A. W. Hubbard, Joseph F. Porter. A paper by Charles H. Ludlie was read, describing the construction of the dam and reservoir at Athens, Ga. Professor Nipher read a paper on "The Volt, the Ohm and the Ampere," being a mathematical discussion of the subject.

American Society of Civil Engineers.

The 35th annual meeting was held in this city Wednesday and Thursday of this week. The officers elected are: President, Thomas C. Keefer, of Ottawa, Canada; Vice-Presidents, J. James R. Croes, of New York, and Robert Moore, St. Louis; Secretary and Librarian, John Bogart, New York; Treasurer, George S. Greene, Jr., New York; Directors, Mendes Cohen, Baltimore; Joseph M. Wilson, Philadelphia; Stevenson Towle, New York, and Alpheus Fiteley, New York.

The next Convention is to be held in Milwaukee.

PERSONAL.

—A. J. Poppleton, General Attorney of the Union Pacific for 24 years, has resigned on account of ill-health.

—Philip E. Chapin has resigned his position as General Manager of the Cambria Iron Works at Johnstown, Pa.

—William Armstrong has resigned as General Editor of the Chicago & Eastern Illinois, and the office has been discontinued.

—John A. Emmons, for the past 35 years station agent of the New York, Lake Erie & Western at Kirkwood, N. Y., died on Jan. 7, aged 61 years.

—The report that General Manager Potter of the Union Pacific is dangerously ill is untrue, and he has no intention of resigning his position with the railroad.

—Mr. F. J. Leigh, who has for some years been chief locomotive inspector for the Indian State Railways, has been appointed superintendent of the Canadian Locomotive Works, Kingston, Ont.

—C. E. Lytle, who has resigned the position of Chief Train Dispatcher of the Buffalo, Rochester & Pittsburgh, was presented this week by his friends in Bradford, Pa., with a diamond stud valued at \$300.

—G. M. Hallstead, of Scranton, Pa., Trainmaster of the main line of the Delaware, Lackawanna & Western, and son of W. F. Hallstead, General Manager of that company, was married on Jan. 11 to Miss Stella M. Coleman, of Scranton.

—J. W. Ferguson has resigned his position of Assistant Engineer of the New York, Lake Erie & Western to accept an engagement with Bernard Kelly & Son, dock and bridge builders, of New York. Mr. Ferguson has been with the Erie for the past ten years, beginning as a rodman.

—Theodore Houston, a well-known railroad man was found dead at his home in New York on Jan. 12 with a pistol shot in his temple. It is not known whether he committed suicide or whether the shooting was accidental. Mr. Houston was 49 years old and was born in Middletown, N. Y. He was an expert accountant when the Oswego Midland road became involved in financial difficulties, and he was appointed its Receiver. He was afterwards a director of the West Shore.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—It is announced that the syndicate that has taken the \$6,000,000 Atchison new issue is composed of Messrs. Kidder, Peabody & Co. and the Banking Bros. of London; Lee, Higginson & Co., E. Rollins, Morse & Co., Irving A. Evans & Co., Brewster, Cobb & Esterbrook, and Parkinson & Burr. It is also understood that Messrs. B. P. Cheney and A. W. Nickerson are included. About one-half of the issue has been taken by Boston. The demand has exceeded the supply, and parties have been asked to cut down their allotment. About \$2,220,000 are 6 per cent. bonds that have been in the Atchison treasury.

Baltimore & Harrisburg.—The election last week resulted as follows: President, Capt. A. W. Eichelberger; directors, J. M. Hood, Wm. S. Rayner, Charles W. Slagle, Wm. H. Vickery, David Willis, C. W. Humrichouse, A. M. Wirt, J. S. Boyer, D. Horner and J. W. M. McPherson.

Boston & Lowell.—F. L. Higginson has been chosen President to succeed President Morey, who declined a re-election.

Buffalo, Rochester & Pittsburgh.—Edward Kahoe has been appointed trainmaster of the Pittsburgh Division, headquarters at Bradford, vice C. E. Lytle, resigned. E. D. Wells has been appointed trainmaster of the Buffalo and Rochester divisions, headquarters at Buffalo.

Buffalo & Williamsburg.—The following directors were elected last week: Messrs. N. P. Stanton, of New York; James Tillington, N. C. Scoville, J. S. Buell, B. J. Tillman, William H. Watson, Leonard Dodge, Edward S. Turner, F. D. Stow, T. M. Johnson, Charles Barrick, C. C. Pickering and William Meadows.

Canadian Pacific.—J. N. Sutherland has been appointed General Freight Agent of the Ontario division, vice E. Tiffin, resigned.

Central Iowa.—A. F. Banks has been appointed General Agent at Peoria, Ill., vice W. W. Raife, resigned.

Chicago Santa Fe & California.—B. T. Lewis has been appointed Fuel Agent.

Cumberland Valley & Unaka.—The incorporators of this Georgia Company are William H. Case, George B. Corlan and Adolph Montanton.

Dayton, Fort Wayne & Chicago.—William Nelson Cromwell has been elected to the vacancy in the directory caused by the resignation of W. C. Boone.

Des Moines & Kansas City.—James Donahue has been appointed Superintendent of this company, which is the new organization of the Des Moines, Osceola & Southern. His headquarters are at Des Moines, Ia.

Duluth, Fergus Falls & Southern.—The following officers have been elected: President, Jacob Austin, of Fergus Falls, Dak.; Vice-President, C. E. Gray, of St. Louis; Treasurer, E. E. Corless, of Otter Tail County; Secretary, James A. Brown, of Otter Tail County.

Fort Worth & Denver City.—E. P. Henderson has been appointed Master Mechanic, vice M. R. Kiley, resigned.

Hosack Tunnel & Wilmington.—The company was organized at Holyoke, Mass., last week, with the following officers: President, Daniel H. Newton; Vice-President, Jas. Ramage; Treasurer, John C. Newton; Superintendent and Auditor, Moses Newton; Secretary of the Board of Directors and Clerk, Ernest P. Cox; directors, J. C. Newton, Moses Newton, D. H. Newton, James Ramage, and George W. Millar, of New York.

Illinois Central.—W. W. Chamberlain has been appointed Traveling Freight Agent, headquarters at Columbus, O.

Ishbel & Iron Mountain.—The company has organized with C. H. Castle, of Illinois, as President; J. P. Boyd, Vice-President; W. H. Nance, Secretary; and John E. Ishbel, General Manager.

Jamestown & Franklin.—At the meeting in Stoneboro, Pa., last week, the following directors were elected: John Newell, O. G. Getzen-Danner, S. P. McCalmont, J. C. Cornwell, R. P. Cann and O. D. Bleakley. Rasselas Brown was elected President.

Lake Erie & Western.—S. B. Sweet has been appointed Assistant General Freight Agent.

Lehigh Valley.—At the annual meeting this week the following officers and directors were elected: President, Elisha P. Wilbur; directors, Charles Hartshorne, William A. Ingham, George Maize, Robert H. Sayre, James L. Blackshee, John R. Fell, Robert A. Lamberton, John B. Garrett, Charles O. Sheer and William Brockie.

Mississquoi Valley.—The following directors were elected last week: Worthington C. Smith, F. S. Stanahan and E. C. Smith, of St. Albans, Vt.; T. H. Perkins and Augustus Russ, of Boston; S. P. Carpenter and A. W. Woodworth.

Missouri Pacific.—J. H. Richards has been appointed General Attorney of the following companies, Fort Scott, Wichita & Western, Wichita & Colorado, Salina, Sterling &

El Paso, Kanopolis & Kansas Central, Kansas Southwestern, Denver, Memphis & Atlantic, Verdigris Valley, Independence & Western, and LeRoy and Caney Valley.

S. H. Shanklin has been appointed Superintendent of the Pueblo extension, headquarters at Ossawatomie, Kan.

Monterey Extension.—The directors of this new California company are: Charles Crocker, Charles F. Crocker, Timothy Hopkins, W. V. Huntington and N. T. Smith.

New York, Ontario & Western.—At the meeting in New York this week the following directors were elected: Thos. P. Fowler, Chas. S. Whelen, Chas. J. Russell, H. Pearson, Joseph Price, Francis R. Culbert, Byron D. Benson, J. Coleman Drayton, John Greenough, William H. Paulding, Eben K. Sibley, Julian L. Myers.

The only change in the board was the election of E. K. Sibley and Julien M. Myers in the places of H. O. Northcote and T. Swinyard. The board elected Thomas P. Fowler President and John Burton Secretary and Treasurer.

Ortonville & Southwestern.—The incorporators of this Minnesota company are: William Van Eps, of Sioux Falls, Ia.; A. D. La Due, of Milwaukee, Wis., and C. E. Brooks, T. M. Grant and C. H. S. Lange, of Ortonville, Minn.

Pittsburgh Junction.—At the meeting this week the old officers and directors were re-elected, with the exception of the substitution of T. H. Garrett for Robert Garrett.

Portland & Ogdensburg.—At the annual meeting in Portland, Me., this week, the following directors were elected: Samuel J. Anderson, Horatio N. Jose, Weston F. Milliken, Charles H. Amsden, Stephen R. Small, Francis Fessenden, Frederick N. Dow, W. W. Woodbury, Sidney W. Thaxter and C. J. Chapman.

Poughkeepsie & Delaware Valley.—Grinnell Burt has been elected Vice-President.

Richmond & Danville.—Capt. W. H. Green has been appointed General Superintendent. W. B. Ryder succeeds Capt. Green as Superintendent of the Richmond Division, and J. H. Walsh succeeds Mr. Ryder as the Trainmaster of the Greensboro Division.

Rochester & Honeoye Falls.—The directors of this New York company are: Oliver Allen, Mumford; Thomas Brown, Scottsville; Seldon S. Brown, Scottsville; Allen C. Beach, Watertown; James E. Childs, New York; Roswell P. Flower, New York; Alexander M. Holden, Honeoye Falls; John M. Beckley, Rochester; George A. Buck, Rochester; Donald McNaughton, Mumford; Gilbert A. Macpherson, Rochester; George Moss, Rochester; Henry D. McNaughton, Rochester. The directors have elected officers as follows: Vice-President, Allen C. Beach; Secretary, George Moss; Treasurer, Henry D. McNaughton; Chief Engineer, A. Grant Childs; Attorneys, McNaughton and Taylor; Finance and Auditing Committee, Gilbert T. Macpherson, Seldon S. Brown, Alexander M. Holden, of Honeoye Falls; Executive Committee, Roswell P. Flower, Donald McNaughton, Oliver Allen, Thomas Brown, George Moss, Henry D. McNaughton and the President ex-officio.

Raritan River.—The following are the directors of this new road in New Jersey: E. Tucker, New York; S. P. Knapp, New Brunswick; G. A. J. Milair, Rahway; E. T. Day, Jersey City; J. B. Conklin, Catskill; Allan S. Goodkin, New York; Edlow W. Harrison, New York; D. C. Chase, South Amboy; W. D. Edwards, Jersey City; W. G. Bumstead, Jersey City; W. H. Taylor, New York; George H. Kendal, New York; Elias J. Day, Jersey City.

St. Louis, Arkansas & Texas.—H. D. Milton has been appointed Master of Transportation, with headquarters Tyler, Tex.

San Antonio & Aransas Pass.—T. A. Lister has been appointed Master of Transportation.

W. H. Reilly has been appointed superintendent of motive power.

San Francisco & North Pacific.—H. C. Whiting has been appointed General Superintendent, with office in San Francisco. W. G. Corbaley has been appointed Assistant Superintendent, with office at San Rafael.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—A Chicago dispatch says that the locomotive engineers of the Santa Fe road, meaning, doubtless, the Chicago, Santa Fe & California, and all the roads in the system, have agreed with Vice-President Smith on a new schedule of wages, which provides that all road engineers shall be of equal grade, one year's service as runner of switching engines being practically the only probationary service that will be required of firemen when promoted.

Tracklaying on the Kiowa extension reached Pauhandle City, Tex., last week, and will go no further during the present month. The company is building extensive yards at that point.

Baltimore & Ohio.—There were three attempts made last week to have the stockholders authorize the creation of the proposed \$5,000,000 issue of third preferred six per cent. stock according to the agreement made with the syndicate of bankers, all of which were failures.

Buffalo, Rochester & Pittsburgh.—A mortgage of \$10,000,000 in favor of the Union Trust Co. was filed in Buffalo this week.

Canadian Pacific.—The Chief Justice in British Columbia has decided against the road in the suit of the Attorney-General of British Columbia against the Canadian Pacific, to recover a bond of \$250,000 for not bringing the road to English Bay within the stipulated time. The defendant claimed that injunctions issued by the Supreme Court prevented it, but the Chief Justice decided this was no excuse.

It is stated in the Canadian press that this company will add 10,000 box and platform cars and 200 locomotives to its equipment. The Montreal shops will be increased to employ 2,500 more men than at present.

Cape Fear & Yadkin Valley.—Work was begun on the Stokdale & Madison branch of this road in North Carolina last week.

The city of W. Imlington, N. C., will donate \$150,000 cash to this company in consideration of Wilmington being made the terminus of the road.

Cedar Falls & Minnesota.—The company has filed answer to the Dubuque & Sioux City's application to be relieved of its lease of the Cedar Falls & Minnesota line. It denies the charge of fraud and all other allegations made, and alleges that the Illinois Central assumed the lease of the road; denies that the Central Central assumed the lease for 20 years instead of the whole term of 40 years; alleges that the present directors of the plaintiff do not manage it for its interest, but in the interest of the Illinois Central. In denying the plaintiff pleads that the plaintiff is not the party in interest, and that the action is barred by the statute of limitations. The answer reveals that the value of betterments

placed on the Dubuque & Sioux City by the Illinois Central has been placed at \$560,000.

Charleston, Cincinnati & Chicago.—S. D. Dunaway, of Knoxville, Tenn., has contracted to build 85 miles of this road between Shelby and Cranberry, N. C.

Chester Valley.—The road was sold at auction this week to representatives of the Philadelphia & Reading for \$555,000. The road was put up for sale by James Boyd, Trustee of the mortgage of \$500,000. The road is 21½ miles long, extending from Downing to Bridgeport, Pa., and had been operated by the Philadelphia & Reading.

Chicago, Kansas & Nebraska.—The engineering corps in charge of Capt. E. L. Preston has entered Texas, and has located the line from Caldwell, on the southern boundary of Kansas, to Wichita Falls, Tex. The Rock Island system contemplates two lines across Texas, both running north and south, and work on both routes will begin within 30 days.

The preliminary survey was completed last week to Wichita Falls, Tex.

Chicago, Santa Fe & California.—James C. Clark, of the Illinois Central, was recently engaged by investors in the bonds of this new line to make an impartial report upon its construction and prospective earnings. This has been done, and Mr. Clark reports that the rapidity of construction and character of the work has never been equaled before in this country. He finds the track the best 70-lb. steel, the bridges across the Mississippi, Missouri and four other large rivers iron, upon first-class masonry, and constructed to carry the heaviest locomotives likely to be used in this country for many years; the location upon the shortest line, and, though crossing the drainage of the country, it has 89 per cent. of straight track, a maximum grade of 42 ft. between the Mississippi and Missouri Rivers, and 38 ft. to Anconia. The Chicago terminals Mr. Clark finds as good as those of any other railroad, and so located that they can be increased in the future. By its own tracks the Atchison will be able to reach every railroad now entering Chicago for interchange of cars or traffic, and one advantage the Atchison terminals have over competitors is that they can be reached from the south side of the Chicago River without crossing railroad tracks.

Cleveland & Canton.—The company has recently completed a two-mile branch to Cas-ingham's coal mines near Coshocton, O., and is about to build another two-mile branch to some coal mines near Osnaburg, on the Carrollton branch. Work will be commenced at once on the new draw-bridge at Cleveland.

Columbus Southern.—Taver Bros. & Cummings, of Columbus, Ga., have commenced work on their contract to build 23 miles of this road.

Cumberland Valley & Unaka.—This company has been incorporated in Georgia.

Danville & Seaboard.—Surveys have begun for this road, which is to extend from Danville, Va., to Henderson, N. C.

Des Moines & Kansas City.—The Receiver has turned the Des Moines, Osceola & Southern over to the purchaser, M. V. B. Edgerly, of Springfield, Mass. The name of the new organization has been changed as above. In the Spring the road is to be made standard gauge and extended.

East Alabama.—The company will soon commence locating its extension from Roanoke to Anniston, Ala.

East & West Alabama.—Plans are being perfected for widening this road to standard gauge.

Flint & Pere Marquette.—The litigation between the common stockholders of the company and the company itself to enjoin it from buying the Port Huron & Northwestern has taken a new turn. The injunction was secured from Judge Brown, in Detroit, last fall. A motion to dissolve the injunction was denied last month. Last week Judge Brown discovered that his wife was first cousin to President John F. Sanborn, of the Port Huron & Northwestern. He at once announced to the attorneys that he would sit no longer in the case, and that a motion to dissolve must be reargued before another judge. Accordingly an application has been made to Judge Jackson, in Cincinnati.

Florida Railway & Navigation Co.—The Florida Central & Western division, running from River Junction to Jacksonville, Fla., 241 miles, will be sold at Receiver's sale at Jacksonville on Feb. 9.

Fort Worth & Denver City.—Track is laid to the Texas state line 458 miles from Fort Worth. The Fort Worth & Denver Company is now operating the road to Clearendon, Tex., and the remainder of the road is being operated by the Panhandle Construction Co.

Frenchman Valley & Wyoming.—This road is complete from Holyoke, Col., to Cheyenne, Neb., and it is quite certain that the entire line from Culbertson to Cheyenne will be finished by next June.

Gurdon & Fort Smith.—Work will soon begin on this road, which is to run from Fort Smith, Ark., to Gurdon. The road is built by the Missouri Pacific.

Hoosac Tunnel & Wilmington.—The company was organized last week at Holyoke, Mass., with a capital stock of \$50,000. The railroad commissioners have issued a certificate authorizing the road to open its line for public travel. The directors decided to lease the three miles of the Deerfield River Co.'s line in Vermont. The road will be extended from Readsboro, Vt., to Wilmington as soon as the towns along the line show sufficient interest in the matter to contribute their share of the expense. The bonded indebtedness of the road is about \$45,000.

Hudson Suspension Bridge & Railway Co.—The stockholders at a meeting this week voted in favor of authorizing the issue of first mortgage bonds of the company to the amount of \$10,000,000, to be secured by a first mortgage on all its franchises, rights and property, and to take up the bonds outstanding of the issue of 1876. The new bonds will cover not only the bridge property, but 50 miles of road which will connect the bridge with existing systems.

Isbell & Iron Mountain.—Work will soon commence on this road, which is to extend from Isbell, Ala., to Russellville, 13 miles.

Indiana, Bloomington & Western.—There is a slight obstruction in the reorganization of the company, the assessment of the stock being insufficient to meet the expenses of reorganization by from 175,000 to \$200,000. Chairman J. D. Campbell, of the purchasing committee, is expected to induce the Cincinnati, Sandusky & Cleveland and Columbus, Springfield & Cincinnati companies to agree to a moderation of their demands. The 25th of January is now named as the date for the completion of reconstruction.

Indianapolis, Quincy & Missouri.—A resolution has been filed reducing the capital stock of this company from \$4,240,000 to \$400,000. The company is a part of the Indianapolis, Decatur & Springfield system.

Kansas City, Wyandotte & Northwestern.—The road has been completed from Kansas City to Seneca, Kan., a distance of 116 miles. Connection is made at the latter place with the St. Joseph & Grand Island.

Kingwood & Tunnelton.—This ten mile road in Preston County, W. Va., is about completed. It is intended to extend it to Fairchance during the coming season. George M. Whitecarver, of Grafton, W. Va., is Superintendent.

Leavenworth & Denver Short Line.—The line is surveyed from Stockdale, Kan., 216 miles westward. The length of the road will be 350 miles in Kansas and 140 miles in Colorado.

London & Northwestern (England).—The New York office of this company is removed from 3 Broadway to more commodious quarters at 852 Broadway, near Union Square, which will be the headquarters of Mr. C. A. Barratoni, General Passenger and Freight Agent for the United States.

Louisiana, Arkansas & Texas.—This company has contracted with the levee board of the Tensas basin levee district to build and maintain a system of levees across the Boeuf Cut-off Swamp, in the state of Arkansas, to be used as a roadbed for the railroad, about 23½ miles long, to be finished by April 1, 1889. The levee board will pay \$50,000 to the railroad company when the levee is finished and received by the State Board of Engineers, under whose direction it is to be built; also 90 per cent. of the proceeds of the state lands in the district for a period of 10 years; also a 5-mill tax upon all the property in the district subject to overflow for a period of 20 years; also 1½ cents per acre upon all the lands in the district subject to overflow for a period of 10 years.

McKeesport & Belle Vernon.—Drake & Stratton, of McKeesport, Pa., have been given the contract for the portion of this road between McKeesport & Elizabeth.

Missouri Pacific.—The Nebraska Pacific road has been turned over to the Nebraska Agent of this company, and instructions have been given to push the line to completion. The road as surveyed was from Warwick northwest through Nuckols and Webster counties to the west line of Adams County, about 70 miles, and is only partially graded. Surveys have been ordered and the line will no doubt be extended westward from Pauline, in Adams County, to Kearney, thence northwestward to Broken Bow.

Mobile & Mobile.—The incorporators met last week and resolved to organize the company in Alabama under the general laws. A preliminary survey has just been begun. The road will run from Mobile in a direct line to the Yazoo Valley, a distance of 80 miles.

Moncton & Buctouche.—Tracklaying on this road is completed from Moncton to Humphrey's, and trains will be running between Moncton and Buctouche in a few days.

Monterey Extension.—Articles of incorporation filed in California for the purpose of building a road from Monterey, northwestward to Pacific Grove, thence southward to the mouth of the Carmel River. Capital stock \$250,000.

New Roads.—Arrangements are being consummated in Detroit, Mich., for the building of an electric railroad between that city and Mount Clemens, a distance of 20 miles, which will be the longest electric road in the country. Willis C. Turner, of the Van Depole Construction Co., is the projector.

A company is being organized to build a road from the Chattahoochee River to Atlanta, Ga., a distance of 7 miles.

A road is to be built from Hammetton to Tuckerton, N. J., 18 miles, by Joseph D. Wharton, of Camden.

New York, Lake Erie & Western.—The company asks bids for 20 consolidation locomotives.

New York & New England.—The Boston Post says, regarding this road: This company has recently sold the balance of \$396,000 second 6s which it held in the Treasury at a good fair prize, viz., par and accrued interest. In regard to the report that November net earnings were from \$20,000 to \$30,000 less than last year, we are authorized to state that all the reports current regarding the net earnings of this road for that month are nothing but "guesses"; that the net earnings for the month will not be known until the statement for the last quarter in 1887 is issued, which will be some time in the early part of next month. The gross earnings for November were \$31,000 in excess of November, 1886. During the month the company laid 1,000 tons of steel rails, the expense of which is charged to the operating expenses of that quarter, against no steel rails laid in the last quarter of 1886.

New York, New Haven & Hartford.—There is talk of extending the branch of the Northampton Division from New Hartford, Conn., to Lee, Mass.

Oregon Improvement Co.—President Elijah Smith has issued a circular to the stockholders of the company in which it is stated that owing to the failure to obtain sufficient subscriptions to the \$2,000,000 of preferred stock offered to the stockholders in May, and to "the necessity of providing for the increased business by carrying on the construction work, it has been necessary to use the net earnings for that purpose; and we believe that this action, if carefully considered, will be heartily approved by every stockholder. If this policy is pursued, it will require the net earnings of from eight to ten months more to provide funds sufficient for all necessary improvements, and no dividends can be expected by the common stockholders until after that time. This will probably be disappointing to many stockholders, and in order to hasten the date of resumption of dividends, the directors have decided to ask again for subscriptions to the preferred stock, with the assurance that if the balance of the authorized issue is taken, the payment of dividends will be resumed at once. The balance of the authorized issue is \$1,150,000 and each stockholder can subscribe for as large an amount as he desires to take. If more than the authorized sum is taken the subscriptions will be reduced pro rata."

Ortonville & Southwestern.—Articles of incorporation filed in Minnesota. The proposed road will extend from Ortonville southwestward through the counties of Yellow Medicine, Pipestone and others. Capital stock, \$3,000,000.

Pennsylvania.—This company intends to elevate its track across Federal street in the city of Allegheny. All the plans are preparing for the elevated railroad through Jersey City, but it is not yet decided whether the line to the present passenger station will be used or the passenger terminus made at Harsimus Cove. The probabilities are that nothing will be done in the way of construction until the company gets a clear right of way without any reservations.

The company will build a tunnel in Toledo, O., to connect its North Toledo yards with the new belt road that will be built from the Wheeling & Lake Erie tracks to a junction with the Michigan Central at West Toledo.

The company has bought the train of 50 cars used in the Westinghouse air brake tests.

Pennsylvania Company.—The locomotive engineers of the Pennsylvania Company's system west of Pittsburgh

have asked for an advance of 10 per cent. in wages and the abolition of the "double-header" system. The committee was received by Mr. McCrea, the General Manager, and Mr. Baldwin, the Manager of the Pennsylvania Co. It is rumored that the Pittsburgh, Fort Wayne & Chicago will, in part, grant the request of the yardmen and train hands for an increase in wages, and that the Chicago scale will be conceded without the "time-and-a-half time" feature.

Pensacola & Memphis.—Construction work has begun on this road, which is to extend from Pensacola, Fla., to Memphis, Tenn. It connects at Meridian, Miss., with the Warrior Coal Fields road, which extends from Meridian to Decatur, Ala., and runs through rich coal and iron fields. The latter road is being built in the same interest, and it is stated that orders will soon be given for a considerable number of coal, freight and passenger cars.

Philadelphia & Reading.—All effort to arbitrate the troubles of this company and its striking employés have failed, and it has now become a question of endurance as to which party can hold out the longer.

Pittsburgh & Lake Erie.—The investigation into the alleged crookedness in the passenger and ticket departments of the line has been completed and will be presented to the directors at their meeting next Monday. A. D. Smith, General Passenger and Ticket Agent of the road, will be reinstated. Two employés will be dismissed, but it is not likely that any prosecutions will take place.

Princeton, Marion & Ohio.—The company will be ready to let contracts for building the road, 16 miles in length, about Feb. 1. R. W. Wilson, Marion, Ky., is President.

Quebec & Lake St. John.—This road is finished to within one mile of Lake St. John, and trains are running. Mr. H. J. Beemer has made a new contract with the Directors. He is to carry the line westward to deep water at Roberval, on Lake St. John, and eastward to Chiboutim, on the Saguenay, and build branches aggregating 40 or 50 miles. He is to put a steamer on Lake St. John and build quays. The contract amounts to some \$3,000,000 and is to be completed by December, 1889.

Raritan River.—This company has been organized to build a road from South Amboy through Sayreville, Little Washington and Milltown to New Brunswick, crossing the Pennsylvania above grade at the latter place, and running directly as possible up the west side of the Raritan River to Bound Brook, connecting there with the Central of New Jersey and Lehigh Valley roads just east of their stations. The contract has been awarded, and the work is to be done by July 1.

Rocky Fork & Cooke City.—The company is about to let a contract for building the 20 miles of the Cooke City extension from Red Lodge, Mont., southward. The grading and bridging have just been completed from near Laurel, on the Northern Pacific, to Red Lake.

Rochester & Honeoye Falls.—Articles of incorporation have been filed in New York. The object is to build a road from Rochester through the townships of Brighton, Henrietta, Rush and Meadow to Honeoye Falls. At the latter place it will connect with the Canandaigua, Batavia & Tonawanda branch of the New York Central & Hudson River. This will be a distance of 16 miles. It is the intention of the company to ultimately extend the line on through Lima to Blood's Station on the New York, Lake Erie & Western. Capital stock of company, \$320,000. Headquarters Rochester, N. Y.

St. Louis & San Francisco.—Arrangements have been completed for the extension of the Salem (Mo.) branch of this road to Little Rock, Ark.

St. Paul, Black Hills & Pacific.—Surveys are being made for this road, which is to be run from Dickinson to Deadwood, Dak., and from Aberdeen to Milnor, Dak., a total distance of about 278 miles. Contracts for construction are expected to be let about April 1. W. L. Richards, of Jamestown, Dak., is chief engineer.

St. Paul & Duluth.—The extension of this road from St. Paul, Minn., to Omaha, Neb., is now said to be seriously contemplated by the management. Surveys are being made for an air line across the prairie from Council Bluffs to St. Paul, and if a practicable route can be obtained so that a road can be built at a reasonable cost the work will be begun.

Salt Lake & Los Angeles.—Further information concerning this enterprise is to the effect that the road is now an assured fact. It will be an independent line, starting from Salt Lake City, and running westward along the southern shore of the Great Salt Lake, then southward in Utah; very close to the Nevada state line, for a considerable distance, and then across the line through Nevada to the south of the Meadow Valley range. On entering California, the Calico mining district will be traversed, and the Atlantic & Pacific road will be crossed at Barstow. From there the line will continue southwestward through the Arroyo Seco Canyon back of Pasadena, and thence through the latter town to Los Angeles. The whole length of the road will be 641 miles. From a point north of the Calico mining district a branch will be built to Mojave.

Savannah, Dublin & Western.—The road has passed under control of the Central of Georgia by the purchase of the interest held by President Simmons of the first-named road.

Texas Central.—It is reported that the road is to be extended to a connection with the Fort Worth & Denver City at Vernon, Tex., and that work will commence inside 60 days.

Virginia.—Bills have been introduced in the Legislature to incorporate the Danville & East Tennessee, the Danville & North Carolina and Richmond & Eltham railroad companies.

Wells, Fargo & Co.—This company has taken charge of the express business on the Houston & Texas Central, succeeding the Pacific Express Co., and will on Feb. 1 take charge of that on the Gulf, Colorado & Santa Fe, succeeding the Texas Express Co.

West Jersey.—It is reported that this company will extend its double track from Newfield to Millville, N. J., in the spring.

TRAFFIC AND EARNINGS.

Dressed Beef Rates.

Messrs. Fink and Blanchard have recommended, and the roads have adopted and ordered, a change in the dressed beef rates to meet the demand of the Chicago & Grand Trunk for a larger differential. It was announced on Jan. 13 that for the ten days following that date the Grand Trunk rate would be dropped 2 cents, and that from Jan. 23 the rate by that road would be 62 cents and by all the others 67. This will leave the Grand Trunk rate where it was before, and will raise the regular rate by the other lines 2 cents, leaving the differential 5 instead of 8.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of December :	1887.	1886.	Inc. or dec.	P. c.	Total whole Sys.	1887.	1886.	Inc. or dec.	P. c.
	\$210,302	\$158,971	I. \$51,331	22.2	Net. 1,482,423	3,641,951	2,900,641	I. 741,310	25.5
Atlantic & Pac....	233,500	194,712	I. 38,793	19.9	Net.....	3,760,950	3,812,037	I. 386,721	35.2
Buff., N. Y. & P....	305,375	306,729	D. 1,404	0.4	Total (gross) ...	\$10,194,258	\$8,776,035	I. \$1,418,223	16.1
Bur., C. R. & No....	63,077	63,269	D. 192	0.2	Total (net) ...	3,760,950	3,812,037	I. 502,864	13.2
Cairo, V. & C....	151,701	90,408	I. 61,293	67.8	Eleven months—Jan. 1 to Nov. 30:			D. 51,977	1.3
Canadian Pac....	1,143,000	894,100	I. 248,900	27.8	Bur., C. R. & No.	\$2,70,587	\$2,626,530	I. 74,057	2.8
Central of Iowa....	134,518	126,737	I. 7,781	6.2	Net.....	685,647	704,225	I. 38,578	5.4
Ches., O. & S. W....	199,631	166,875	I. 32,756	19.6	Ches., O. & S. W.	1,798,547	1,546,459	I. 252,097	14.5
Eliz., Lex. & B. S....	87,833	80,846	I. 6,987	8.6	Chi. Bur. & No.	734,413	580,369	I. 154,044	26.5
Chi. & East. Ill....	184,699	167,027	I. 17,672	10.5	Net.....	2,134,200			
Chi. & Ind. Coal....	46,507	3,084	I. 16,423	51.5	Den. & R. G.	507,847			
Chi. & Ohio R.	4,143	9,169	D. 5,026	54.6	D. 7,269,286	6,102,844	I. 1,166,422	19.1	
Chi. & W. M.	96,914	99,612	D. 2,726	2.7	Net.....	3,608,820	2,350,151	I. 758,748	33.7
Cin., N. O. & T. P....	298,097	271,105	I. 26,992	9.9	D. 45,667	217,475	I. 218,192	100.3	
Ala. Gt. South....	158,545	129,523	I. 29,022	24.4	Kentucky Cent....	193,222	116,904	I. 76,318	65.2
N. Ost. & N. E....	83,636	82,621	I. 1,012	1.3	Net.....	849,236	1,101,133	I. 137,095	16.1
Vicks. & Mer....	63,341	67,469	D. 3,068	4.5	Mexican Nat....	423,897	312,192	I. 111,705	35.7
V., Shre. & P....	71,758	77,210	D. 3,652	7.3	Net.....	1,624,866	1,589,651	I. 33,815	2.2
Total. C. N. O. & T. P....	676,377	628,071	I. 48,306	7.6	Rome, W. & O.	193,500	288,043	I. 94,543	32.8
Cin., R. & F. W....	34,609	34,746	D. 137	0.3	Minn. & St. L.	1,364,974	1,400,435	I. 35,461	2.5
Cin., & Springfield....	95,968	102,122	D. 6,154	6.0	Net.....	403,614	451,468	I. 43,854	9.7
Cin., W. & Balt....	198,183	177,129	I. 21,054	11.8	D. t. b. & co's.	3,608,820	2,350,151	I. 758,748	33.7
Cleve., Ak. & Col....	46,719	40,855	I. 5,864	14.3	T. & L. & B. & co's.	38,270,099	3,49,255	I. 5,579,444	15.2
Cleve. & Mar....	381,253	351,982	I. 29,271	8.2	Net.....	11,087,412	6,773,045	I. 5,213,467	76.9
Col. & Clin. Mid....	31,548	29,047	I. 2,501	8.6	Rome, W. & O.	2,951,794	2,645,384	I. 306,413	11.5
Col., H. V. & T....	234,796	252,142	D. 17,345	6.8	Minn. & St. L.	1,364,974	1,400,435	I. 35,461	2.5
Den. & R. G. W....	94,425	90,500	I. 3,925	4.3	Net.....	191,229	1,170,040	I. 155,954	13.1
Det., B. C. & Al....	31,000	24,542	I. 6,458	25.5	San A. & Aran. P.	500,592	.....	.....	.....
Det., Lan. & No....	81,137	98,181	D. 17,044	17.3	Net.....	1,056,724	867,932	I. 188,832	21.7
Det. & Mar. & Marq....	39,731	22,554	I. 17,177	76.0	Gal. H. & S. A.	3,032,306	2,352,793	I. 679,513	29.8
E. Ten., Va. & G....	493,610	420,619	I. 72,991	17.3	Net.....	599,466	261,445	I. 338,021	129.3
Ev. & Indiana (polis)....	10,904	17,160	I. 2,744	15.0	Louisiana & West....	765,948	578,637	I. 187,321	32.3
Ev. & Terre H....	66,678	61,094	I. 5,84	9.1	Net.....	376,049	294,005	I. 82,044	5.4
Flynt & P. M....	205,369	103,569	I. 11,800	51	Morgan's L. & T.	4,003,527	3,700,604	I. 362,913	9.8
Fla. Ry. & N. Co....	115,898	119,522	D. 3,624	3.0	Net.....	1,056,724	867,932	I. 188,832	21.7
Ft. W. & Den. C....	73,460	46,251	I. 27,009	58.8	N. Y. Tex. & M.	1,447,850	1,447,850	I. 10,305	7.0
Georgia Pacific....	124,499	96,528	I. 27,971	28.9	Net.....	18,842	8,460	I. 10,32	122.1
G. Rap. & Ind....	169,994	203,298	D. 33,304	16.3	Texas & N. O.	1,148,437	896,015	I. 252,422	28.1
Grand Trunk....	1,339,594	1,425,836	D. 86,342	6.0	Net.....	524,963	383,198	I. 141,764	30.7
Gulf, Col. & S. F....	356,270	234,646	I. 121,624	51.8	Atlantic System....	9,165,288	7,972,824	I. 1,492,464	9.3
H. Cen. (Ill. Div.)....	602,600	626,051	I. 23,451	3.7	Net.....	2,576,044	1,815,001	I. 761,043	41.9
southern Div....	508,300	486,670	I. 21,630	4.4	Pacific System....	24,614,822	21,532,787	I. 3,190,035	9.2
In., Bloom. & W....	207,502	209,972	D. 2,470	1.1	Total So. Pacific....	33,818,110	10,561,049	I. 688,507	6.3
Ind., Dec. & Spr....	30,540	61,277	D. 30,757	50.1	Net.....	11,229,556	29,205,611	I. 4,612,499	15.7
K. C. Cl. & Spr....	20,216	16,855	I. 3,361	10.8	Total (gross) ...	\$81,220,861	\$78,874,288	I. 12,346,573	15.6
K. C. Ft. S. & G....	218,046	220,794	I. 2,748	1.2	Total (net) ...	92,744,198	25,022,385	I. 7,894,788	31.5
K. C. Sp. & Mem....	171,693	104,128	I. 7,655	4.6	D. 176,975	0.7			
Kentucky Cent....	88,259	71,461	I. 16,798	23.4					
Keok. & West....	27,818	27,460	I. 358	1.3					
L. & E. & W.	160,670	155,185	I. 5,485	3.5					
Lehigh & H.	15,149	21,004	D. 5,855	21.8					
Lou. & St. L.	100,151	66,983	I. 33,165	49.4					
Louis. & Nash....	1,431,270	1,279,905	I. 152,365	11.9					
Louis. N. A. & C....	167,597	155,595	I. 12,002	7.7					
*Mex. Central....	152,625	154,399	I. 1,774	1.1					
*Mex. National....	80,304	56,536	I. 23,608	41.8					
Mil. & Northern....	149,124	149,184	D. 9,060	6.0					
Minn. & St. L.	68,175	63,535	I. 4,640	7.3					
Miss. & Tenn....	224,182	287,024	D. 44,842	15.6					
Mobile & Ohio....	275,482	239,946	I. 45,536	19.8					
Nash. & C. & St. L.	3,229,021	2,945,663	I. 283,958	9.6					
N. Y. C. & H. R....	117,897	98,555	I. 19,342	19.6					
Norfolk & West....	371,345	248,213	I. 123,132	49.6					
Northern Pacific....	1,174,003	899,665	I. 274,428	30.5					
Ohio & Miss....	341,629	290,918	I. 44,711	15.0					
Ohio River....	33,574	17,812	I. 15,762	88.5					
Ohio Southern....	62,672	32,839	I. 29,833	90.9					
Pearl, Dec. & E....	77,177	77,797	I. 12,476	7.0					
Pitts. & West....	159,833	153,552	I. 6,281	4.0					
Rich. & Danville....	425,400	340,148	I. 85,252	25.0					
Va. Mid. Div....	131,100	120,513	I. 10,587	8.7					
Chas., C. & A....	76,400	67,304	I. 9,096	13.5					
Col. & Gr. Div....	62,800	54,893	I. 7,907	14.4					
West. N. C. Div....	51,900	42,165	I. 9,735	23.0					
Wa., O. & West....	11,000	8,500	I. 2,500	29.4					
Ashve. & Spa....	7,200	3,200	I. 4,000	125.0					
Tot. Rich & Dan....	765,800	636,723	I. 129,077	20.7					
+St. L. & T. H.									
Main line	196,207	169,881	I. 26,326	15.4					
Branches	88,084	88,602	D. 518	0.5					
St. L. Ark. & T....	293,800	236,514	I. 57,296	24.2					
St. Louis & S. F....	581,352	504,041	I. 77,311	15.3					
St. P. & Duluth....	137,365	115,651	I. 21,714	18.7					
St. P. M. & Man....	905,264	700,161	I. 205,103	29.2					
San A. & Aran. P....	70,359	23,750	I. 46,600	195.7					
Shen. Val....	73,000	54,315	I. 18,685	34.4					